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AMBULANCE LECTURES;

OR

WHAT TO DO IN CASES OF ACCIDENT OR SUDDEN ILLNESS.

BY

LIONEL A. WEATHERLY, M.D.,

SURGEON TO THE 1ST GLOS. ARTILLERY V. CORPS;
LECTURER TO THE AMBULANCE DEPARTMENT, ORDER OF ST. JOHN OF JERUSALEM IN ENGLAND.

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To

The Ambulance Department

of

The Order of St. John of Jerusalem

In England.

PREFACE.

I HAD given one course of Ambulance Lectures to the Officers and Non-commissioned Officers of the 1st Gloucestershire Artillery Volunteer Corps, and had commenced another course to the Superintendents and Inspectors, &c., of the Great Western Railway and some of the staff of the Joint Station at the Bristol Terminus, when it struck me that, as at present no book had been published on this subject, except perhaps Surgeon-Major Shepherd's Handbook (which can be obtained of the St John Ambulance Association), and which is not a series of lectures, but more or less a book of epitomised rules, the Lectures might form a useful work for the policemen, railway officials, and other men engaged in large works, as well as for the public at large. I must thank Mr Herbert Page for kindly allowing me to publish his capital rules for the "Arrest of Arterial Bleeding," as also Mrs Fenwick Miller for kindly allowing me to take many valuable hints from her clearly-written descriptive letterpress in her new work, "The Atlas of Anatomy." These hints have enabled me to make my first two Lectures more easily to be understood. And lastly, but not least, I must thank Miss Carlyon for assisting me in the numerous diagrams throughout the book, the majority of which are original. I have studiously avoided saying too much with regard to the treatment of different injuries and sudden illnesses, feeling sure that if the work of the St John Ambulance Association is to continue doing good, all its Lecturers must guard against attempting to make the public what they often want to be made—"medical men in embryo."

LIONEL A. WEATHERLY.

PORTISHEAD, SOMERSET,
16th Feb. 1880.

PREFACE TO THIRD EDITION.

THAT this little work should have reached its fifth thousand in a few months is a success beyond my most sanguine expectations ; but as I think that no author ought to allow a new edition to appear without trying to improve upon the old one, I have in this, as far as possible, availed myself of the numerous and valuable hints that have been most kindly given me by a large number of medical men interested in this work of the St John Ambulance Association.

I cannot too strongly impress upon all connected with that Association the fact, that this book was not written in any spirit of opposition to their own work by the late highly-esteemed Surgeon-Major Shepherd, but really as a help, for the readers of their book, to enable them when practicable to see the *rationale* of their treatment, and refresh their memories prior to and after examination, which could, I maintain, be better accomplished by reading a series of lectures, however condensed, than by attempting to learn by heart a set of epitomised rules.

L. A. W.

PORTISHEAD, SOMERSET,
21st June 1880.

LECTURE I.

INTRODUCTION.—*A general outline of the Structure and Functions of the Human Body.*

THE St John Ambulance Association, under whose banner these lectures are delivered, is one whose work, if properly taken in hand, must of necessity do good. Its object is to furnish plain and simple rules, which may enable any one knowing and understanding them to act, in cases of accident or sudden illness, for the welfare of the suffering patient until the arrival of professional help. It is a difficult thing no doubt for persons having but a slight knowledge of the treatment of certain injuries or sudden illnesses, to prevent themselves, when their services are needed, from stepping beyond the boundary of help to the land of interference; but I hope that all who are attending this course of lectures will never prove themselves guilty of what a medical man might justly call presumption.

It is necessary, for the better understanding of these rules and the *rationale* of their adoption, that you should know something about the structure and function of that wonderful piece of mechanism the Human Body; and let me assure you, that no one who takes up this subject by beginning in a proper spirit and a right method, can possibly fail both to be instructed and surprised. Common sense tells us that the knowledge to a certain extent of how we live and have our being cannot fail to be advantageous to the preservation of public health.

It is not, however, easy to explain in order the various

parts of which the body is composed, for they have that mutual dependence upon each other, that continual circle of action and reaction in their various functions, and that close dependence in respect of their individual parts; that, as in a circle there is no point of preference from which we should begin to trace its course, so in the human body there is no function so insulated from the other functions, no part so independent of other parts, as to determine our choice. Still, as it is absolutely necessary to follow some order, I cannot do better than begin by describing the

SKELETON, or bony framework.—The bones are formed as a basis for the whole system, fitted to support, defend, and contain the more delicate organs. They are the most permanent parts of all the body. Do we not see them remaining for ages, the memorials of the dead and the only remains of creatures which no longer exist, and the proofs of such changes in the globe as we cannot trace but by their uncertain mark? Now while the bones in general serve as a basis for the soft parts, supporting and directing the motions of the body, certain bones have a higher function in containing and protecting those organs whose offices are the most essential to life. Thus the skull defends the brain; the ribs and breast-bone the heart and lungs; the spine the prolongation of the brain, as it were, viz., the spinal cord: and bear in mind that the injuries to each of these bones are important in proportion to the value of the organs they contain. I shall not attempt to describe, or even mention, all the numerous bones of which the skeleton consists, but shall content myself with describing the skeleton as divisible into three parts, viz. :—

I.—Head { Skull cap. / Face. } II.—Trunk { Back-bone or spine. / Ribs and breast-bone. / Pelvis. }

III.—Limbs { Bones of shoulder, arm, forearm, and hands.
Bones of thighs, legs, and feet.

I.—THE HEAD. The bones of the skull cap are eight in number, and those of the face fourteen. They are all, with the exception of the lower jaw bone, firmly fixed to each other.

II.—THE TRUNK. Let us first look at the *Back-bone or Spine.* This is so named from certain projecting points of each bone, which, standing outwards in the back, form a continued ridge. This long line consists of twenty-four distinct bones called Vertebræ. They protect the spinal cord from harm the whole length of the spine, and support the weight of the trunk, head, and upper extremities; and perform at certain points the chief turnings and bendings of the body. Between each of these bones is placed a soft and pliant substance, yet perfectly elastic, called the Intervertebral substance, and in leaping, jumping, shocks from falls, &c., the elasticity of this substance acts like a buffer, and prevents any harm to the spine or spinal cord. The *Ribs and Breast-Bone* form the chest. The ribs, whose office it is to give form to the chest and to cover and defend the heart and lungs, also assist very materially in the breathing process, for they are joined to the spine behind by regular hinges which allow of short motions, and to the breast-bone in front, or to one another, by pieces of gristle, which yield to the motions of the ribs and return again, when the muscles by which they move cease to act. They are twelve in number. The seven upper, called *true ribs*, are fixed to the breast bone. The five lower, called *false ribs*, are attached in front to one another and not directly to the breast bone.

The Pelvis is interposed to give a steady bearing to the trunk, and to connect it with the lower extremities by a sure, firm, yet very movable joint. Its arch is wide and strong, and the bones are large

III.—The Limbs. Each lower limb is composed of a large thigh bone (*femur*), a knee cap, two bones of the leg (*tibia and fibula*), and the small bones of the ankle and foot. Each upper limb is composed of a shoulder-blade, a collar bone, a large arm bone (*humerus*), two bones of the fore-arm (*radius and ulna*), and the small bones of the wrist and hand. The great peculiarity about the upper limb is that it is not connected directly with the trunk, like the thigh bone with the haunch, but that it is hung by a movable and intermediate bone, viz., the shoulder-blade.

Let us now pass on to the

MUSCULAR SYSTEM.—Muscle is an animal tissue composed of soft and usually reddish fibres, and is endowed with a peculiar property, viz., *Contractility*, i.e., the power which its fibres possess, when stimulated by the will or other means, of shortening themselves, and thus approximating the points to which their extremities are attached.

Muscles are divided into two classes, viz.:

Voluntary, or striped muscle, and over these the will exercises a direct control. Each of these muscles consists of bundles of fibres enclosed in a sheath, and two extremities or tendons for its attachment to bones; and

Involuntary, or unstriped muscle, whose action is not under the control of the will. These muscles are connected with the internal and nutritive parts of the body, as the heart, the muscular coats of the stomach, intestines, &c.

The muscles which regulate the motions of the limbs, etc., are laid in layers on the bones, and are so arranged that though lying in close contact with each other, yet in their action they are often quite insulated. The muscles and their arrangement all afford the most wonderful example of mechanical perfection, utterly unattainable by the most skilled workman; for, however

accurately a machine may be constructed, each motion of the wheel is attended with a certain amount of waste, which gradually, but surely, tells upon the machine until it is completely worn out. Not so in the human body, for so long as the vital power remains in vigour, the muscular part of the body while in health, instead of being worn out by use, rather acquires more strength, and grows and is invigorated the more it is used towards its proper end; and no more striking proof of this can be seen than the blacksmith's strong and brawny arms, with their muscles, as Longfellow so well describes them, standing out like iron bands. This muscular machinery, possessing this wonderful power of contractility, does not however go off all of itself, for as Dr Milner Fothergill so well describes it in his useful book on the *Maintenance of Health*, "it remains like a gun loaded and the hammer raised, another force applied to the trigger is required to let it off, and this force for the muscle is called the nerve current." Of this nerve current you will hear when I come to describe the nervous system.

THE JOINTS.—The bones and muscles are only part of that beautiful mechanism by which the motions of the human body are performed, for the parts by which the bones are joined to each other are varied according to the use of each part; so as to give a natural and easy shape to the limbs, security and firmness to the motions, and smoothness to the joints by which these movements are performed. A joint is the junction of any two bones however firmly or loosely connected. Commonly two substances besides the bones forming the joint are employed in the establishment of their connection, viz.:—1, a strong, firm tissue, called a *Ligament*, which we may consider as a band by which the bones are joined together; and, 2, a peculiar substance called *Cartilage*, or gristle, which is often placed between the surfaces of the bones forming

the joints. All joints are also lined by a thin membrane called the synovial membrane, which secretes a glairy fluid, and thus the joints are, as it were, kept well oiled.

Joints are of three kinds. 1. *Immovable*, as the joinings of the bones of the skull. 2. *Movable*, as the hip-joint, &c. 3. *Mixed*, as the different joints of the spine. Let us now pass on to the study of the

NERVOUS SYSTEM—And what a truly wonderful study this is. It seems impossible to attempt to describe it at all in the short time that I must of necessity allot to it; for I can assure you that the working of this system so excites one's admiration as to fix one spell-bound while its intricate mysteries are unfolded. We may divide the nervous system of man into four parts:—

1. A large mass of nervous matter situated in the skull, and called the *Brain*.

2. A long cord of nervous matter filling up the cavity of the spinal column, and called the *Spinal Cord*.

3. The white threads, if I may so use the expression, called *Nerves*.

4. The small masses of nervous matter, each one of which is called a *Ganglion*.

The great central mass is the

BRAIN.—"By it the body is set in motion, thought has its residence in it, as also has memory. It not only devises the plans of buildings, the schemes of commerce, the day dreams of the visionary and the theories of philosophers, but it evolves the force which is requisite to put them into execution when practicable." * From this brain proceed the nerves of special sense—viz., the nerves of smell, sight, taste, and hearing.

The brain is sub-divided into the *Cerebrum*, the *Cerebellum*, and the *Medulla Oblongata*.

The *Cerebrum*, or brain proper, is the seat of the in-

* *The Maintenance of Health.*

tellect, the emotions and the will, and fills up almost the whole of the cavity of the skull.

The *Cerebellum*, or small brain, lies at the back of the head, and, as far as we at present know, the function of this small brain is to regulate the movements of the body.

The *Medulla Oblongata* is that part between the brain and the spinal cord, and in it the nerve fibres cross, so that injury or disease of one side of the brain produces paralysis on the opposite side of the body.

The *Spinal Cord* is a cylindrical column of soft nervous tissue. It is both a nervous centre and a conductor of nervous influence. From its sides proceed 31 pairs of nerves. These spinal nerves arise from the cord by two roots—an *Anterior Root*, which is the root for *motion*, and a *Posterior Root*, which is the root for *sensation*. These nerves proceed to all parts of the body, conveying the power of perceiving impressions to all, and the power of motion to the muscles.

If the spinal cord is cut through, all parts of the body supplied by the nerves given off below this point are paralysed—that is, they have no sensation or motion.

From experiments it has been definitely ascertained :—

1. That all impressions producing *Sensation* always pass from the circumference of the distribution of the nerve to the centre, and this centre, the seat of sensation, is the brain.

2. That all impressions producing *Motion* pass in the opposite direction—*i.e.*, from the centre to the circumference, or rather, from the brain or spinal cord to the muscle or organ.

The *White Threads*, called *Nerves*, pass, then, to all parts of the body, branching and re-branching till the smaller filaments are unseen to the naked eye, and they are of three kinds, motor nerves, sensory nerves, or compound nerves. A *motor* nerve conveys an impulse from the brain to a muscle ; a *sensory* nerve receives

and conveys an impression to the brain; and a *compound* nerve, containing both motor and sensory fibres, possesses both these functions.

But besides this system of nerves having their centre in the brain and spinal cord, and being under the influence of the will, we have another nervous system, for, as Dr Milner Fothergill, in his book before mentioned, so quaintly puts it, "it would indeed be excessively awkward if our digestion were to depend upon voluntary effort, for if a man had to direct his digestion at the risk of its stopping when his attention was withdrawn, humanity would, I am afraid, present a curious spectacle for some time after the customary meal hour, and man's activity would be marvellously crippled. Suppose the liver were to stop acting because it was forgotten, and the nerve order for it to go on were suspended by an engrossing matter as speculation or love-making, humanity would indeed be thrown out of its groove and the progress of the race be arrested beyond the powers of even antibilious pills to restore it. This second nervous system has its centres in the abdomen chiefly, and is called the *sympathetic* or *ganglion nervous system*, and nerve fibres connect it with the other system—viz., the brain and spinal cord system. Along these pass nerve currents, which are stored up in the centres or ganglia of this system, and from these centres they again pass off in a continuous manner to maintain the action of the heart, the stomach, liver, or intestines. The nerve force of this system is then regularly distributed without the action of the will to the different organs of organic life. Thus a blow on the head will knock a man senseless, but he still lives and survives; but a blow of like violence upon the pit of the stomach is often followed by instant death, because the great centre of the organic nerves lies there, and the vital actions are suspended by the blow, so that the system never lives to recover."

LECTURE II.

A general outline of the Structure and Functions of the Human Body (concluded).

Let us now proceed to the important study of the

CIRCULATION OF THE BLOOD, and in doing this let us look at one, by one, the different parts of the circulatory apparatus. Firstly, then, we have the

HEART.—This hollow, muscular organ is our pump-engine for sending the blood coursing all throughout the whole body. Let it cease its action but for a few moments and we are gone. For life to go on, this heart must always be at work, as Dr O. Wendell Holmes so beautifully describes it—

> "No rest that throbbing slave may ask,
> For ever quiv'ring o'er his task."

The heart is placed on the left side of the chest, and is divided, firstly, into two longitudinal halves by a thick muscular wall, these halves having no direct communication whatever between each other. Each of them is again divided into an upper and a lower portion by a strong fibrous membrane, and in this fibrous membrane is a hole, by which the blood can pass from the upper into the lower portion. The upper cavities are called *Auricles*, and the lower *Ventricles*, and thus we have a right and left Auricle and a right and left Ventricle. Now if the hole in this partition between the Auricle and Ventricle on each side were perfectly open and unprotected, then, after the Auricles have squeezed the blood into the Ventricles, as we shall presently see they do; and the Ventricles in turn begin to squeeze the blood onward into the large artery from which all the

arteries in the body spring; and into the artery which sends the blood to the lungs; it stands to reason that a great deal of the blood in the Ventricles, instead of going into these arteries, would flow back into the Auricles, and thus keep up an obstruction to the blood current. To provide against this, each of these holes has valves, which are so formed that they allow the blood to pass freely from the Auricles into the Ventricles, but when the Ventricles contract to force the blood onward, they fall back, and thus prevent any regurgitation or flowing back into the Auricles. These valves, as it were, flap into the Ventricles, but are fastened to the walls of the cavities by little cords called *chordæ tendineæ*, which prevent the valves when the Ventricles contract from flapping back into the Auricles. The vessels proceeding from the heart have also valves at their commencement to act in the same way. The heart is enclosed in a bag of shining membrane, called the *Pericardium:* a like membrane also lines the inside of the heart and is called the *Endocardium*. The vessels which convey the blood to and from the heart are called

A vein cut open showing the pouch-like valves.

BLOOD-VESSELS, and are of three kinds —viz., Arteries, Veins and Capillaries.

The *Arteries* are the vessels which carry the blood *from* the heart all over the body. They carry bright red blood;* their walls are stronger and more elastic than those of the veins.

The *Veins* are the vessels which carry the blood *to* the heart. They carry dark blue impure blood.† They are furnished with what the arteries are not, viz., valves. These valves are, as you see in the annexed figure, pouches

* Except the Pulmonary arteries, which carry the dark impure blood from the right side of the heart to the lungs.

† Except the Pulmonary veins, which carry bright red purified blood from the ungs to the left side of the heart.

of membrane, with their mouths turned in one direction —viz., towards the heart. The reason of the necessity of these valves is obvious, for the blood in the veins being, as it were, forced up the hill, would if it were not for these be continually trying to flow back in the opposite direction. The blood, therefore, can readily pass onward to the heart, but when it tries to flow back these pouches swell out and effectually prevent it.

The *Capillaries* are the small network of vessels which run between and unite the smallest arteries and veins. To give you an idea of the smallness of these capillary vessels, I may tell you that the average diameter of one of these is $\frac{1}{3000}$ of an inch ; and, as you all know, it is almost impossible to put the point of even the finest needle through the skin without wounding one of these capillary vessels and letting some blood flow out. And now we come to the consideration of the

Blood itself. The blood is like a carrier, bearing to each organ the supply of nutrition that it requires, and taking away the waste materials which it is necessary to get rid of; and thus the blood running through the arteries goes to supply the tissues of the body with nutriment, and the blood running through the veins brings away their waste. As the blood passes on through all the tissues of the body they draw through the fine-walled capillaries what they each require, and return into the capillaries the waste substances that they want to get rid of. All I shall tell you with regard to the composition of the blood is, that it consists of a clear fluid called serum, a fibrous material called fibrine, and numerous little bodies called corpuscles; and these corpuscles are of two kinds, white and red. The red ones are the most numerous by far, but the white are the largest. All the larger arteries and veins of the body have their own especial names, but it would be absurd if I were to trouble you with even a twentieth

part of these names. I shall, therefore, only briefly describe the course and names of the few larger and more important vessels.

Starting, then, from the Left Ventricle, we find the large artery called the *Aorta*, and after having given off the small arteries for the supply of the heart itself, this firstly gives off three large branches, the *Innominate*, the *left Subclavian*, and the *left Common Carotid*. This Innominate again gives off two branches, the *right Subclavian* and the *right Common Carotid*. These Carotid arteries send off branches to supply the head and face. Each of the Subclavian arteries lies underneath the collar bone, and running down through the middle of the armpit loses its name of subclavian and is called the *Axillary Artery*. This artery now runs down the arm from the middle of the armpit to the middle of the bend of the elbow-joint, and is called the *Brachial Artery*. At the elbow-joint it divides into two branches, the one on the thumb side called the *Radial*, and the one on the little finger side being called the *Ulnar* Artery. These again divide and sub-divide into numerous branches for the supply of the hand and fingers. After the Aorta has sent off these large branches for the supply of the upper part of the body, it bends down towards the left side and runs down alongside the spine, and then divides into two branches called the *Right and Left Common Iliac Arteries*. These divide again into *External and Internal Iliac* arteries, and the External Iliac on each side running down from the middle of the groin towards the inside of the knee-joint is here called the *Femoral Artery*. When this artery gets half way down the thigh it goes to the back of the thigh to the middle of the bend of the knee-joint, where it is called the *Popliteal Artery*, which artery divides into two arteries called the *Anterior* and *Posterior Tibial Arteries*, and these sub-divide again like the Ulnar and Radial arteries in the forearm, for the supply of the foot and toes. The Plate on

page 22 will make the course of these arteries much more clear to you.

All these arteries throughout their course send forth branches, which branch and rebranch until they become so small as to be invisible to the naked eye, and in fact merge into the capillaries of which I have before spoken. The *Veins* which carry the blood back to the heart from all parts of the body begin in these capillaries, and their branches uniting gradually form large vessels, which accompany for the most part the arteries. The large vein that runs alongside the Aorta is called the *Inferior Vena Cava*, and this vein receives all the blood from the veins of the lower extremities and most of the trunk and lower internal organs, and then enters the right Auricle. The large vein that brings all the blood from the veins of the head, face, neck, upper extremities, &c., is called the *Superior Vena Cava*, and it also enters the right Auricle. This part of the circulation, beginning in the Aorta, starting from the Left Ventricle, and ending with the Inferior and Superior Venæ Cavæ, entering the right Auricle, is called the *Systemic Circulation*, because it is the circulation of the system generally. We have, however, so far only dealt with two cavities of the heart, viz., the left ventricle and the right auricle. Now when the impure blood enters the right auricle it is forced on into the *Right Ventricle*, and, the walls of this cavity contracting, force the blood onward into a vessel called the *Pulmonary Artery*, which, dividing into a left and right Pulmonary Artery, carries the impure blood to the lungs, there to be purified of a poisonous gas, of which I shall presently speak when I describe the function of respiration. After the blood has been purified it is carried back by the Pulmonary veins to the *Left Auricle*. From the left auricle it is forced as we have seen into the left ventricle, and again into the systemic circulation. This circulation, beginning in the Right Ventricle and ending in the *Left Auricle*, is called the *Pulmonic* or *Lung*

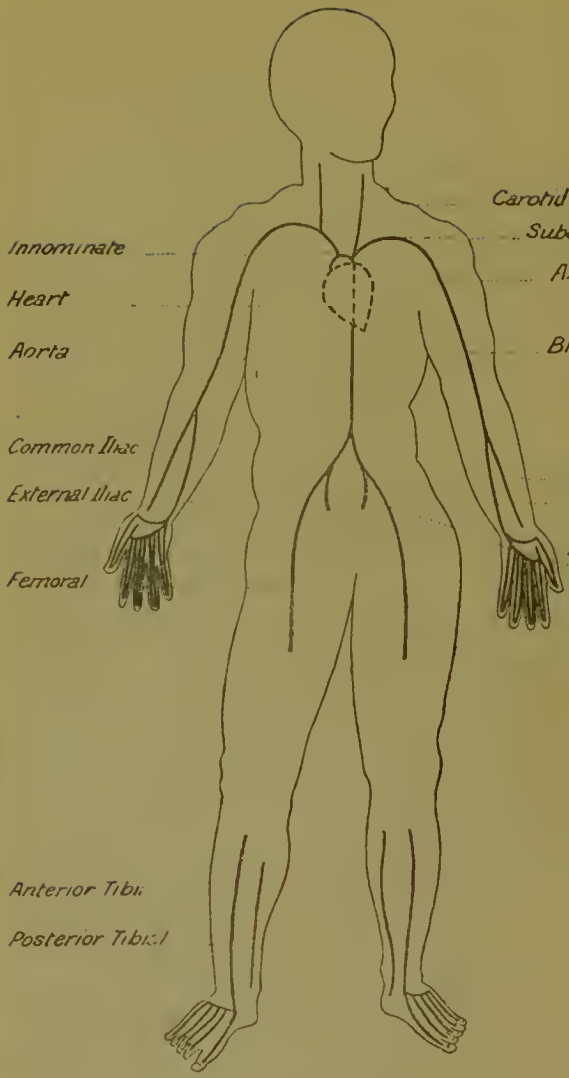
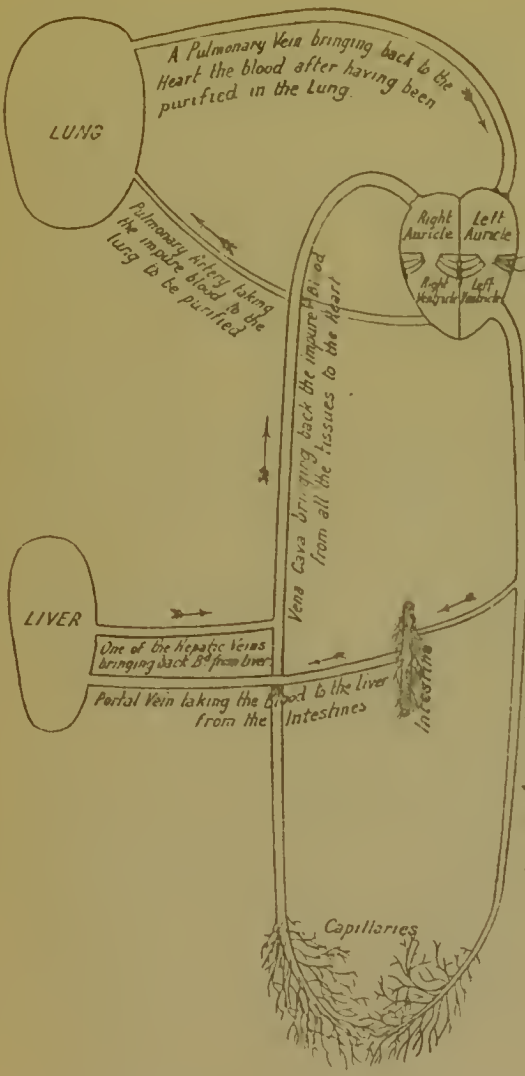


DIAGRAM SHOWING THE COURSES OF THE MAIN ARTERIES OF THE BODY



SIMPLE DIAGRAMATIC EXPLANATION OF THE CIRCULATION

Circulation. By the Plate on page 23, which I have purposely made as simple as possible, you will I hope be better able to understand the circulation system.

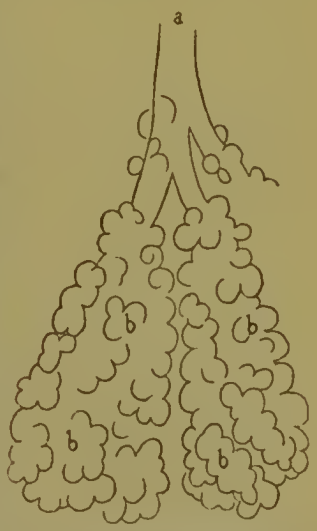
Both Auricles contract together, and then both Ventricles contract together; and it is the action of the Left Ventricle in forcing the blood into the circulation that causes the pulsation or pulse which we can feel in all the larger arteries of the body on which we can place our finger.

We just now spoke of the blood being purified of a poisonous gas by the lungs, and this brings us to the consideration of the

FUNCTION OF RESPIRATION.—Let me here also begin by describing the parts of the Respiratory apparatus. First, then, we have the

LUNGS. We have a right and left lung. The right one is divided into three and the left into two lobes, on account of the heart being on the left side. The lungs, like the heart, are each enclosed in a bag of shining membrane called the *Pleura.* The Pleura of each side folds backwards at both its ends, forming thus a closed bag, the outside half of which bag adheres to the walls of the chest, and the inside covers the lung; and in this bag a little fluid is secreted, in order to make the movements of the lungs easier. Now of what does each lung consist? It consists of *Tubes* by which the air is brought to the lungs, and these tubes are called *Bronchial Tubes.* The *Windpipe* is the stem, as it were, from which all these bronchial tubes branch. This windpipe divides in the chest into a right and left bronchus, and one of these goes to each lung, and these divide and sub-divide just like the arteries do. The smallest of these tubes are very minute indeed, and they spread out at their ends into a dilatation, which consists of small pouches, and these pouches or recesses are called *Air Cells.* The walls of the air cells are very thin, and outside these cells we have the *small capillaries of*

the Pulmonary arteries and veins in a complete net-work. We have also in the lungs besides these tubes, air cells and blood vessels, elastic fibrous tissue for the purpose of binding all together—and of course we have also nerves in the lungs as well.



Terminal branches of the bronchial tubes, with the air cells.
a. Bronchial tubes. b. Air cells.

These air cells are always full of air. Every time we breathe we draw air into our lungs (inspiration) and expel air again (expiration); but don't think for a moment that we can ever quite empty our air vesicles of all their air; there is always a certain amount left behind even after the deepest expiration, and this is constantly mixing with the pure air coming in. Now we know that fresh air is composed mainly of nitrogen and oxygen gas, and experiments have proved that the gas which the blood takes out of the air cells from the air is *Oxygen*, and in exchange the blood passes into the air cells the poisonous gas before mentioned, called *Carbonic Acid Gas*, and this gas is expelled from our blood through the lungs at each expiration. It is the effect of these two gases on the red blood corpuscles that makes the difference in the colour of the blood—in the veins and arteries—oxygen making the blood lighter, and carbonic acid gas making it darker. Now the question you will doubtless ask me is this: how does this poisonous gas form in our body? Well to explain this I must tell you that *Carbon* is a part of every living tissue of our body; and as the pure bright red blood passes through our arterial system the

gas *Oxygen* passes out through the thin walls of the vessels and unites with this *Carbon*, and by this union *Carbonic Acid Gas* is formed. By this union, as well as by the union of another gas called *Hydrogen*, the *Force* of the human body is produced, as also *Animal Heat*. This carbonic acid gas may be looked upon as waste, like the ashes of the fire after they have done their work, and must like them be got rid of.

How do we *Inspire* and *Expire?* This question brings me to the consideration of

MECHANISM OF RESPIRATION.—There are three powers by which respiration is accomplished. 1. A large muscle called the *Diaphragm*. This is the largest muscle of the body, and it also separates the chest from the abdominal cavity. The heart and lungs lie above it, and the other organs of the trunk below it. Its shape is that of an arch, and the concavity of the arch looks towards the abdomen; it is fixed to the ribs and to the spine, and when it contracts it draws the upper part of its arch downwards, a vacuum is produced in the chest, air rushes in, and thus we inspire. When the muscle ceases to contract the arch rises up again, the air is then pressed out of the lungs, and thus we expire. 2. We have certain muscles running from one rib to another and called *Intercostal* muscles, and these are of two sorts, *Internal* and *External*. The external lift the ribs, and thus help inspiration; while the internal depress the ribs, and consequently help expiration. 3. We have the *elastic fibrous tissue* of the lungs themselves, which by pressing on the bronchial tubes thus aid expiration.

In speaking of the formation of the poisonous carbonic acid gas we found that the force and heat of our body were produced by the chemical union of certain gases with the principal elements of our tissues; and that carbonic acid gas was formed by the union of the carbon in the tissues and the oxygen which we

breathe in from the air. Now other chemical unions also take place and produce this heat and force, and the results of these unions leave our body in two other forms, viz., as *Water* and *Urea*. Water being the product of the mixing together, as it were, Hydrogen and Oxygen gas, and Urea of Nitrogen and Oxygen gas. We call these three principal forms of waste, viz., carbonic acid gas, water and urea, the excretions of the body; and this brings us to the study of the

EXCRETORY ORGANS.—They are (1) the *Lungs*, which I have already described, and have shown you how they get rid of the carbonic acid gas; (2) the *Kidneys*, which pass away most of the urea, and a great deal of the water; and (3) the *Skin*, which gets rid of a considerable quantity of all three waste products.

THE KIDNEYS. The structure of these two organs is so complex, that I shall content myself with telling you that they consist of cells, tubes, blood-vessels, and their capillaries, some nerves, and, of course, fibrous tissue to bind all these together. From the blood, as it passes all round the walls of these cells, they take away the urea and water and other salts, and this fluid then passes down the minute tubes into a part of the kidney called the Pelvis, or basin of the kidney; and this pelvis is continuous in each kidney with a tube called the *Ureter*, which carries the fluid called urine into the bladder, to be expelled from the body by that organ.

THE SKIN not only performs the function of an excretory apparatus, but also, as we know, is the seat of the organ of touch. This skin is divided into layers, with which I shall not trouble you, simply telling you that among these layers are numerous little glands called *sweat glands* (there are nearly three millions of these in the body), and they draw from the blood what we call *perspiration*, and it consists of the three waste products, viz., of water, carbonic acid, and urea, besides small quantities of salt.

We have just heard that the animal heat of the human body, and the force by which it performs both its vital and other functions, are both produced by the carbon and other parts of our tissues combining with the oxygen, and it is self-evident that unless these tissues are replenished, life could not long go on. Just as a fire, to keep it burning, requires fuel, so does our body; and the fuel of the body is Food: and this brings me to the description of the process of

DIGESTION. The principal organs of digestion are the Stomach, the Liver, the Pancreas, and the Intestines; but the first part of digestion begins really before the food has got to the stomach. We must masticate it thoroughly with our teeth; we must let it mix thoroughly with the secretion of certain glands in our mouth called *Salivary Glands*, and when this piece of food, which has been thus treated, gets to the back of the mouth, it is seized, as it were, by the muscles of the gullet, and pushed onwards by them into the

STOMACH. This is a muscular bag, and is lined with what we call a mucous membrane, and all over this mucous membrane are seen openings of little glands. These glands are called *Gastric Glands*, and they secrete a fluid called the *Gastric Juice*. It dissolves the food, and changes the nature of some portions of it, as to render it at once diffusible, so that it will readily pass through the fine membrane, forming the walls of the capillaries; and these portions of the food are probably taken up at once by the blood through these capillaries, which, of course, as everywhere else in the human body, form a regular network all over the stomach. The use of the muscular walls of the stomach is to pass the food from one part of its cavity to the other, so that it should come in contact with its walls, and thus the gastric juice is enabled to mix thoroughly with the food, and the blood-vessels are more readily able to take up what they can. The muscles of this bag then squeeze

the remainder of the food, which has been dissolved into a thick liquid called *Chyme*, into the

INTESTINES. These form one long tube nearly thirty feet in length; and this long tube is divided, first of all, into two parts, the first part being the smaller, and called the *small intestine*, and the remaining part is called the *large intestine*. Both these portions are again sub-divided, as follows:—The *small intestine* into the *duodenum*, *jejunum*, and *ileum*, and the *large intestine* into the *cæcum*, *colon*, and *rectum*. At the junction of the small with the large intestine we have a valve called, from its position between the ileum and the cæcum, the *ileo-cæcal valve*, and this valve prevents the mass which has once passed through it into the large intestine from getting back again into the small.

We just now saw how some of the food was dissolved and taken up at once by the blood-vessels into the circulation to feed the tissues; and the remainder, after being dissolved into a thick liquid called chyme, was passed into the small intestine. Almost directly after this has got outside the stomach into that part of the small intestine called the duodenum, it comes in contact with the bile from the liver and the pancreatic juice from the pancreas, which are brought into the duodenum by a tube, and by them the chyme is converted into *Chyle*.

Now, what happens to this chyle? When we look at the internal structure of this intestine, the first point that strikes us is that the internal lining membrane is doubled up, as it were, into numerous folds, and these folds are called *Valvulæ conniventæ;* and, so far as we can see, their purpose is, firstly, to cause the chyle to move more slowly; and, secondly, to increase the surface of the intestinal canal. We next notice numerous glands, and these are of three sorts:—1. The *solitary glands;* 2. Groups of glands called *Peyer's patches;* and 3. Little glandular depressions called *Lieberkühn's glands*. The secretion of these glands still further helps

the digestion of the food as it passes over them. But now we come to notice the most important part of the structure of this small intestine, for we see all over its internal surface numberless little bag-like projections, causing quite a velvety appearance, and these are called *Villi;* and when we come to examine these we find that each villus contains an artery and a vein with the capillary network, as also another vessel called a *Lacteal* or *Lymphatic vessel.* Now, what is a Lymphatic vessel? All over the body, and entering into almost all the tissues, we find small and delicate tubes, which are not blood-vessels. They contain a colourless fluid, and in their course they enter glands called *Lymphatic glands.* In these they divide and sub-divide and emerge again as one or two tubes, and finally all these end in two tubes—first, the Thoracic duct, which opens into the left subclavian vein; and second, the Lymphatic duct, which opens into the right subclavian vein. In the intestines these vessels are called *Lacteals*, and there is no doubt that these lacteal vessels in these villi of the small intestine carry away most of the digested food, and more especially the fatty matters; though of course the capillaries surrounding the lacteal vessels in the villi also take away a good deal of it. We know that in all the food we take there must be some parts of it which cannot be dissolved and digested, and these undigested and useless parts of the food pass now on to the large intestine through the *ileo-cæcal valve*, and are finally expelled from the body. But even in the large intestine the capillaries suck up any portions of digested food that may remain.

There are still two parts of the digestive apparatus to describe, viz., the Pancreas and the Liver.

The Pancreas is a large gland lying behind the stomach, and secrets a fluid called the Pancreatic juice, which is very similar in its action to the saliva in our mouth. It flows out of the gland by a duct, which, joining with the duct bringing the bile from the liver,

enters, as we have already seen, the part of the small intestine called the duodenum.

THE LIVER is such a complicated structure that I cannot give time enough in these lectures to attempt to describe it at all fully, but will quickly try to explain its work and the way it does it. It lies on the right side of the body below the diaphragm muscle, and is divided up into five small portions called *lobes*, and each of these is again sub-divided into small portions, each of which is about the size of a mustard seed, and called *lobules*. These lobules consist of cells, of small ducts or tubes, of arteries, veins, capillaries and nerves, &c. These cells, called *Liver cells*, draw out from the blood while it is passing along the capillaries the peculiar constituents of the *Bile*, and this bile formed, therefore, in these cells is sent through these small ducts, which, gradually uniting, form one duct to the gall bladder, where it is stored up and sent into the intestine during the process of digestion, as before described. The bile not only very materially aids digestion by helping to dissolve the fatty portions of the food, but it also acts as a natural purgative. The Liver has three functions. First, it stores up the sugar formed by the digestive act in the shape of glycogen, an insoluble substance, which is gradually given off again as sugar to maintain the body temperature, and thus acts as the body-granary. It further oxidises and burns off all waste albuminoids remaining over after perfect tissue-nutrition is accomplished. And, thirdly, it secretes bile.

I must here mention that the blood in the veins coming from the intestines, instead of at once going into the large main vein, the Inferior Vena Cava, goes, first of all, to the liver by a vein called the *Portal vein;* and after being, as it were, utilised and purified in the liver, the blood is then sent into the Inferior Vena Cava by veins called the *Hepatic veins*, and so conveyed to the right side of the heart ; and this circulation begin-

ning in the intestines and ending in the hepatic veins is called the *Portal* or *Liver circulation.*

And now, gentlemen, I have finished this hasty outline of the structure and functions of the human body, for I find I have not time to describe the organs of special sense, although I shall probably touch upon them when I come to speak to you of the injuries they are subject to. I can only express a hope that, hurried as this description has been, all of you who have been listening to these lectures will now know something more of, and be able to appreciate better, the wonderful body in which we live.

LECTURE III.

Means of arresting ARTERIAL, VENOUS AND CAPILLARY BLEEDING ; WOUNDS, *and their treatment ;* FRACTURES, *and their immediate treatment ;* FOREIGN BODIES IN EYE OR EAR ; BURNS AND SCALDS, *and their treatment ;* BITES FROM RABID ANIMALS, *and their treatment ;* FROST BITE, *and its treatment.*

ARREST OF BLEEDING.—Loss of blood, whether it be from an artery, a vein, or from the capillaries, is called *hæmorrhage ;* and you must all well know that if severe bleeding is allowed to go on for any length of time, death soon ensues ; and hence it is a wise and useful thing that everybody should know how to arrest, if only for a time, any serious hæmorrhage, until the arrival of a medical man. Indeed, in some cases a life might be, and often has been, saved by this knowledge. To distinguish between arterial, venous, and capillary hæmorrhage, let me tell you, is not very difficult, but yet it is very important. When blood flows in a steady stream, wells out as it were, and is dark coloured, you may be sure it is from a *vein ;* if, however, it flows out with great force and in jets, as if it were being squirted out, and is of a bright red colour, then it is from an *artery ;* and when bleeding is only from the *capillaries* there is simply a general oozing. Of course the larger the vessel and the wound in it, whether it be an artery or a vein, from which the blood comes, the greater the danger—but arterial hæmorrhage is infinitely more dangerous than venous, on account of the force of the current of blood being so much greater through the arteries. Bleeding from a wound of any of the larger main arteries of even the limbs, such as the brachial or

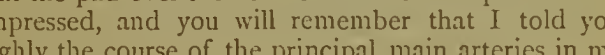
femoral, if not arrested in some way, is sufficient to end life in a few minutes. But, gentlemen, in the large majority of wounds of our bodies, nature arrests this otherwise fatal bleeding in a wonderful manner. I well remember seeing a poor platelayer brought into the Bristol Infirmary some years ago, with both his legs almost torn off, by a train having gone over them, and in this condition he had crawled some two hundred yards to a signal, to stop the next train, and had lain there for some considerable time before he was discovered; and yet with the large arteries of both his legs torn across and wounded in several places he had not died. You will at once ask me, How was this? Well, you know I told you that the coats of the arteries were both muscular and elastic, and it happens that when an artery is torn across, its coats *contract;* and this contraction, by reducing the size of the orifice, diminishes the jet of blood; and the blood current being thus arrested the blood clots, and this clot closes up the mouth of the wounded artery; and be sure and remember that if ever you have to deal with a serious wound, in which you might reasonably expect severe bleeding, but in which the bleeding seems to have stopped, don't meddle in any way with it, by washing, &c., for by so doing you may very easily disturb these clots, thus naturally formed, and bring on a renewal of the bleeding. If, however, nature has not succeeded in checking the hæmorrhage, what is to be done? The great means we rely upon for arresting hæmorrhage for a time is *pressure*, and this pressure can be applied by different means and in different ways. It stands to reason that if the bleeding is from a *vein* that the pressure must be applied to the limb *away*

Handkerchief, Pad and Stick applied to Brachial Artery.

from the trunk, i.e., *below the point of bleeding;* if, however, from an *artery*, then we must apply the pressure *between the wound and the heart*, i.e., *above the point of bleeding*. The direction of the blood currents in the veins and arteries makes the reason for these rules perfectly clear.

Now we may apply this pressure in cases of severe arterial hæmorrhage by the aid of a pocket handkerchief tied round the limb over a firm pad, placed above the course of the main artery of the limb, then by inserting a stick under the handkerchief (see Plate in preceding page), and twisting it, such pressure is brought to bear upon the artery that the circulation of the blood through it is stopped. A piece of stone or any hard substance at hand will answer the purpose of this pad; and if no stick is at hand, one's own fingers can twist up the handkerchief tight enough. To apply pressure in this way you must know where the main arteries run so as to fix the pad over the course of the one required to be compressed, and you will remember that I told you roughly the course of the principal main arteries in my second lecture.

This cut represents an elastic tube, having a hook at each end, invented by Professor Esmarch. To apply



this no knowledge of the course of the arteries is needed. You simply stretch the tube to the full, and wind it, while stretched, round and round the limb; and then fasten the hooks to each other; and I can't help thinking that it would be a wise plan if one of these simple and capital tubes were kept at all the large railway stations and other places, where accidents are of frequent occurrence.

If severe arterial bleeding is taking place in the neighbourhood of joints, it may be arrested by simply

forcibly flexing the joint which is above the wound, or rather nearest to the body; for instance, if you have a severe wound and bleeding of the leg below the knee, by forcibly flexing the leg upon the thigh at the knee-joint, and the addition of a firm pad in the hollow of the joint, and keeping it in this position, you will find that the hæmorrhage is soon controlled.

The Elastic Tube applied.

With regard to venous hæmorrhage, the pressure has, as I have already told you, to be applied on the opposite side of the wound to that when an artery is wounded, and the pressure of a handkerchief alone, if tied sufficiently tight, is usually enough to stop the bleeding, at the same time taking care to keep the limb elevated. With regard to the bleeding from capillaries, it is very easily controlled by either direct pressure to the wounded part, or by simple exposure of the part to the cold air, &c. Mr Herbert Page, of London, has drawn up a capital set of rules for the guidance of the men employed on the London and North-Western Railway, entitled "How to stop bleeding (arterial), with or without the elastic tube," and has most kindly allowed me to publish them. They are so clear and concise that I need say myself no more upon this subject. They are as follows:—

1. When a leg or arm is severely wounded, there may be *no bleeding;* in this case, *raise the limb on cushions above the level of the body*, and carefully watch the wounded part so that the first bleeding may be seen.

2. *Should there be much bleeding*, put on the *elastic tube* as soon as possible (*see rule* 3); but if you have not got the tube near, *raise the limb as high as you can above the body*, and act as follows:—

(*A*). If blood seems to come smartly from one point *place your finger or thumb* firmly on that point, and stop up the places from which the blood is coming.

(*B*). If you cannot see whence the blood flows, then *roll up your handkerchief or cap, and with it press firmly on the bleeding part*, not forgetting to keep the limb raised up.

Note.—In case of *slight bleeding* either of these means just given [Rule 2 (*A*) (*B*)] will generally be sufficient, *the limb being kept raised up.*

3. There is no difficulty whatever in putting on the elastic tube. Let the limb be held up as high as possible, then *stretch the tube to the full, wind it while stretched round and round the bare limb, and fasten the hooks at the ends to each other.*

Note.—If bleeding still goes on after the tube has been put on, you may be sure it is *not tight enough.* You had better, therefore—*with the limb still raised*—take off the tube, and apply it again more tightly than before.

4. The tube must be placed *above the wounded part*—that is, between it and the body—

(*A*). When the *leg or foot* is injured apply the tube *just above* the knee; if the *knee or thigh* be wounded, then place it higher up on the thigh.

(*B*). If the *hand or wrist* be wounded put on the tube *below the elbow;* if blood come from the *elbow or arm*, then put on the tube higher up near the shoulder.

5. If the limb be wounded *so near the trunk that you cannot put on the tube*, then you must do your best to stop the bleeding by one of the plans named in Rule 2.

6. If the injured man has to be carried far, either to a Hospital or his home, bear in mind—

(*A*). To keep him warm with clothing.

(*B*). To keep the limb continuously raised on cushions

(*C*). To look out for bleeding.

(*D*). Not to give *too much* brandy, especially if you have not been able to put on the tube.

Let us now pass on to consider the

TREATMENT OF WOUNDS; and in speaking of wounds remember I mean only the slight ones. Any deep or extensive wounds had best be left alone until the arrival of a surgeon, except so far as arresting the hæmorrhage from them is concerned.

Wounds may be *incised*, as when made by a clean cutting instrument; *punctured*, when the depth exceeds the breadth, as wounds from stabs; *lacerated*, when the parts are torn and the lips of the wound irregular; and *contused*, when effected by bruising.

In the treatment of these the following are the chief points to be attended to:—

1. *Arrest the bleeding.* In most cases of moderately slight wounds, simple elevation of the part and the application of cold or moderate pressure will suffice.

2. *Remove all foreign bodies*, such as dirt, glass, &c., as soon as possible.

3. *Bring the wounded parts in nice apposition*, and keep them so, and this is best done by means of strips of adhesive plaister, first applied to one side of the wound and then secured to the other. These strips should not be too broad, and *space should always be left between* the strips of plaister to allow any matter to escape. If the wounds are too extensive to be kept together by plaister, a surgeon must at once be sent for to put in some stitches.

These rules apply more particularly to incised and slightly lacerated wounds. With regard to punctured and severely lacerated or contused wounds a surgeon should be sent for; although no harm can be done, unless there is any likelihood of much bleeding, by in the meantime washing the wound and removing all other substances. Incised wounds of the face ought to

be brought together as quickly as possible, to prevent future disfigurement. As all wounds about the head are very liable to erysipelas, a medical man ought to be called in; and I shall consequently say nothing about their treatment. My next subject will be

FRACTURES and their immediate treatment. Fractures or broken bones may be of three classes, viz., a *simple fracture*, when the bone is simply broken through in one place; a *compound fracture*, when there is a wound in the flesh communicating with the broken ends of the bone; and a *comminuted fracture*, when the bone is broken into pieces. Now what are the symptoms of fractures? We have first of all the history of the accident, the patient having generally felt or even heard the bone snap; then we have *deformity* of the limb, such as shortening or bending, and if we take hold of the limb, we find there is *increased mobility*, and also we hear and feel a peculiar grating caused by the broken ends of the bone rubbing against each other, and this is called *crepitus*. We have as well *pain* in, and *loss of power* of the limbs.

Coat rolled up forming Temporary Splint.

With regard to the immediate treatment of broken bones, let me say that it is not imperative to do anything to a broken limb before the arrival of a medical man, except to keep it at perfect rest; unless the patient has to be moved, and then it becomes absolutely necessary, to prevent further mischief, that the broken ends of the bone should be put in apposition and kept there. It is a very easy thing for a simple fracture to be converted into a compound one during the removal of the patient unless this is done; and as a

compound fracture is a most dangerous accident, it is easy to see how positively necessary this rule is.

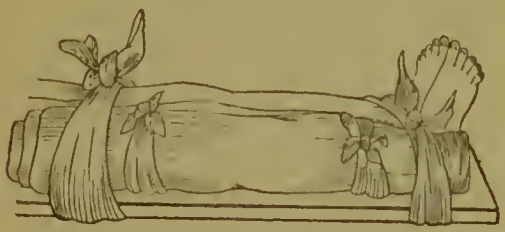
To place the broken ends of the bone in apposition, if there be much deformity, we must produce extension of the limb; and this is done by getting one person to hold the broken limb above the seat of the injury, while you pull at the lower portion of it and extend the limb away from the trunk. When the deformity has disappeared and the limb is straight, you have now to keep it in this position; and this is done by means of splints. Extemporised splints may be formed of numerous things, such as folds of newspapers, umbrellas, twigs of trees, &c. A very useful temporary splint can be quickly made by putting a coat or waistcoat underneath the broken limb, and then rolling it up from each side towards the sides of the limb, and then securing this by means of two or three handkerchiefs tied round as shown in preceding page. One of the ordinary trellis flower pot covers, if at hand, makes a most useful temporary splint; after first of all putting some soft material round the limb. If no such material is to be had, this simple splint could be put over the sleeve in the case of a broken arm, or over the trouser if it is a broken leg, and the patient is a man.

Trellis Flower Pot Cover Temporary Splint.

A broken leg should always be fastened, after being put up in splint, to the sound leg by a handkerchief at the ankle and above and below the knee before the patient is removed; and for further safety's sake it is well to fasten a piece of board under the legs, as shown.

A broken thigh may be treated before removal of patient, by firmly drawing down the injured limb by

traction at the ankle, until it corresponds in length with the opposite limb; and then fastening the two legs together at the knee and ankle by handkerchief or



Board under Legs.

bandages. It is always, however, safer to apply as well some form of splint, and the rolled up-coat for the sides and a piece of thin board or other substance for the front of the thigh would ensure almost perfect safety during transit.

A fractured arm requires the immediate support of a sling, which may at once be made by a handkerchief fastened round the neck.

I have been speaking now of fractures of the extremities; and with regard to the deformity arising from these fractures you will readily understand that if only one of the two bones of the leg or forearm be broken the deformity would be very slight, and perhaps imperceptible, as the sound bone keeps the limb straight and the broken ends of the bone more or less in position; still even in these cases splints are necessary, and the same precautions should be used before the patient is removed.

FRACTURES OF THE RIBS are of very common occurrence, and give rise to great pain, because every time the injured person breathes, the ribs rising and falling, allow the broken ends to grate against each other and on the pleura. The temporary method of relieving this pain and keeping the broken ends in apposition, is by

rolling a good wide flannel or calico bandage pretty tightly round the chest three or four times. More can be done, but it had better be left to the surgeon when he arrives. With regard to flesh wounds in connection with broken bones, no better or simpler dressing can be used at the time than fine linen rag and pure cold water.

I have purposely avoided saying anything about the treatment of dislocation, as I consider that no one but a medical man should ever attempt to reduce this deformity, as serious injury might easily be caused by so doing.

FOREIGN BODIES IN THE EYE.—There are none of the minor accidents to which we are liable more frequent than this, and what can be much more painful or irritating? Now one of the most general things that we do when we get anything in our eye, is most vehemently to rub the injured organ, with the vain delusive hope of rubbing the offending body out. Instead of which we only make the eye dry, inflamed and more painful; and in all probability, if the foreign substance be at all pointed, as, for instance, a piece of iron filing, a stone chip, &c., we make the extraction of it infinitely more difficult.

No matter what it is that has got into the eye (with perhaps the exception of mortar and lime) always remember this—viz., to keep the eyelids closed for as long as you can without touching them; the reason of this rule will be obvious to you when I tell you that in the outside corner of our eye and under the upper eyelid there is a gland which is continually secreting and pouring forth a fluid we call the *tears*. Now this fluid lubricates the surface of the eyeball and then runs down a little tube, whose orifice we can see at the inner corner of our eyes, into the nose. Emotion, grief, or pain, will almost always cause this little gland to pour forth a large amount of this fluid, too much in fact to

escape by the tube before-mentioned, and so it flows over the eyelid and down the cheek. Well, when a foreign substance gets into the eye and we at once close the eyelid without rubbing it, this fluid welling out will in most cases be sufficient to wash the offending substance, if not absolutely on to our cheek, yet so near to the edge of the eyelid as to be easily removed. Should this not answer, it is best to gently bathe the eye with a moistened soft handkerchief or sponge. If, however, a piece of flint or iron or other hard substance be in the eye you will generally find it under the upper eyelid, and to remove it from this position we must turn up the lid; this is done by laying a small probe or the blunt end of a darning needle or a worsted needle across the upper lip, about half-an-inch from its margin; then by taking the middle eyelashes between the finger and thumb and drawing them outwards and upwards, whilst at the same time the probe is gently pressed upon the lid, and the patient is told to look down, the eyelid is easily averted. The foreign body then comes into sight, and can be readily removed with something soft, as a camel's hair brush, a feather, &c. If, however, the body be embedded, and consequently does not move, the patient must at once see a surgeon. Mortar or lime in the eye occasions great pain and injury if not quickly removed. If seen *immediately* the eye should be well washed with a tepid solution of vinegar and water (about a teaspoonful of vinegar to two ounces of water), and the lid being everted, as before described, all particles should be removed. A drop or two of oil dropped into the eye after will often greatly soothe it.

FOREIGN BODIES IN THE EAR.—Unless the foreign body be quite close to the orifice and readily and easily capable of being removed, be sure and *never* attempt to meddle with the ear. It is most dangerous, and the extraction of any body far into the ear canal

ought to be left entirely to the surgeon. I well remember a case of death from the meddling in attempting to extract the bone end of a ball programme pencil which had been in this way pushed through the drum of the ear, and had then found its way into the internal ear and there had set up inflammation, which extending to the brain soon became fatal. Even syringing under these circumstances had much better be left to the medical man, for injudicious syringing might do much more harm than any possible good.

We next come to the immediate treatment of

BURNS AND SCALDS.—It is perfectly extraordinary the number of deaths that are attributed to these causes, and especially among the young. Children will be children, and they will take a delight in playing with the fire, with pouring boiling water from the tea-kettle down their throats and over their chests, while their mothers' backs are turned. In all cases of burns and scalds, except in the very slightest ones, the patient should be seen as soon as possible by a medical man; as, besides the local treatment, the constitutional symptoms consequent upon these accidents require grave attention. All I shall therefore tell you about these cases, is with regard to the immediate local applications. The patient's clothes having been most gently and cautiously removed, being cut in all places where they adhere to the burnt and scalded skin, and any blisters having been simply pricked, the surface should at once be covered with some unirritating substance which excludes the air and keeps up a good heat. For this purpose many things are advocated, such as flour, starch, a mixture of collodion and castor oil, or "Carron Oil," which is equal parts of lime water and linseed oil, and is a most popular and good application. A smooth, thick layer of cotton wool should be laid over this, or if this is not at hand wrap the patient in a blanket; but be sure and not let the blanket touch any

raw places without the intervention of a piece of fine linen rag soaked in oil of some sort. Otherwise it would stick to the part, causing great and needless pain when the surgeon removes it to examine the extent and depth of the burn or scald.

HYDROPHOBIA has been during the past few years so prevalent, that I had better say a few words with regard to the treatment of

BITES OF RABID AND OTHER ANIMALS.—With regard to bites of dogs, a handkerchief or anything else that would answer the same purpose should be as soon as possible tied tightly round the limb between the bite and the heart, so as to stop the poison from getting into the general circulation, if possible. The wound might then be well sucked, bathed with water and a strong caustic applied, and by far the best is the strong nitric acid. If the bite has been inflicted by an animal known to be rabid, the patient should at once be taken to a surgeon; but otherwise it is better not to let the patient imagine any serious consequence resulting from the bite.

With regard to snake bites, I may tell you that these have been best treated by the free use of stimulants, so as to attempt to counteract the great prostration which always ensues, burning the wound which the fang has made with nitric acid, and by following out the instructions I have already given you with regard to bites of rabid animals.

Stings of insects are exceedingly painful, and sometimes give rise to great swelling and even inflammation, and the best treatment for these is to withdraw, if possible, the sting, and then to apply to the wound a strong solution of ammonia either in spirit or in water. Sal volatile and a little laudanum is also a very efficacious application. Of course if there be any depression or fainting consequent upon these stings some stimulant, such as brandy and water, should be given. A sting

of a wasp or bee may be best extracted by pressing a watch-key firmly over it, so that the sting is squeezed up into the hollow of the key.

FROST BITE is not very common in this country, although during the past two winters some cases have happened. The great object in the immediate treatment of frost bite is to bring about *very gradual reaction* of the circulation in the part. This is best done by placing the patient in a room without a fire and gently and continuously rubbing the part with snow, or some other cold application. Never apply heat, as by so doing you may easily set up mortification. A little warm coffee or brandy and water may be given if necessary from time to time. The after treatment, which requires great care, must be left to a medical man.

LECTURE IV.

SPRAINS *and their immediate treatment;* BLOOD-SPITTING; INSENSIBILITY—*causes and immediate treatment;* POISONING *and its immediate treatment.*

SPRAINS.—The definition of a sprain is "a sudden forcible stretching of the tendons or ligaments, or both combined, of a joint," and it is an accident that is always accompanied by most acute pain, and generally followed by rapid swelling. As it is always a tedious and troublesome affair, and as it often leads to more serious results, it is wise in all cases, except the very slight ones, that a surgeon should be called in. The immediate treatment is, to give the injured part at once perfect rest, and keep it in an elevated position, applying cold water continuously. Another way of treating immediately a sprain, is to immerse the injured part in a vessel of as hot water as can be possibly borne, and after keeping it there for say fifteen minutes, to apply frequently hot bran poultices. This plan often gives very great and speedy relief. But as in many cases of supposed severe sprain it is difficult to say whether or no one of the bones forming the injured joint is broken, it is wise to treat these cases by the same rules as those I laid down when telling you the treatment of fractures before the removal of the patient.

BLOOD-SPITTING from the lungs, if excessive, is very alarming and dangerous; and although, as a rule, the person suffering from it is under medical treatment, it often happens in severe blood-spitting that the loss is very great before the arrival of the surgeon. What,

then, should be done at once in these cases, you will ask? Let the patient have plenty of fresh cold air to breathe; apply cold wet cloths to the chest, and give a dose of turpentine, about a table-spoonful, in a little milk; and last, but not least, after adding to a small jug of boiling water a couple of table-spoonfuls of turpentine, let the patient inhale the vapour from it. This last remedy will usually stop the hæmorrhage as soon almost as anything; but *all* these remedies had better be combined.

The next subject I come to—namely,

INSENSIBILITY—is one of considerable importance; and, yet, as I am only supposed in these Lectures to tell you what you should do for the welfare of the patient until the arrival of professional help, I feel almost inclined to dismiss the subject with one simple rule to be observed in all cases; but I fear you would not be satisfied with this. How often do we take up the morning paper and see in its columns an account of some poor creature having been found by the police in an insensible condition in the streets and carried by them to the nearest station-house, and having died, if not before the arrival there, at least soon after; and the public with one accord exclaim, "Another police blunder; dying, not drunk!" There can be no doubt whatever in my own mind that one golden rule ought to be laid down for the guidance of all policemen as well as the general public—viz., *always to treat every case of insensibility as if it were of the gravest nature, and to remove the patient as quickly as possible to the nearest hospital or medical man's house.* By doing this they could never do any harm; and how often might they at least spare the feelings of the bereaved relatives of some poor creature who has been taken off to the nearest police-station, there to die, away from those near and dear to him, and his case mistaken for one of besotted drunkenness.

I, for one, quite agree with some of the police surgeons, that it is a most absurd thing for the public to expect a policeman to come to a right conclusion of what a person who has been found by him in an unconscious condition is suffering from, when even medical men, who have given their special study to these cases, often fail to arrive at a right diagnosis; but if the simple rule mentioned above were in every case adopted, they would then, at least, be always on the safe side.

Now let us look for a moment at the chief causes of insensibility; and here let me say that by insensibility is meant the suspension of the functions of animal life, except those of respiration and circulation. These causes are—

1. *Injuries to the brain*, with or without fracture of the skull itself.

2. *Diseases of the brain*, such as *apoplexy*, *epilepsy*, *tumours of the brain*, &c.

3. *Poisoning by narcotics*, as opium, morphia.

4. *Poisoning* by drink.

5. *Blood-poisoning from advanced kidney* disease.

6. *Fainting* from failure of the heart's action, either from shock, or excessive bleeding, or exhaustion.

Now, supposing that you find a person anywhere in an unconscious condition, and the smell of their breath leads you to believe that their present state has been caused by drink, always remember this, that even if it be true that the person has been indulging too freely, it often happens that the case is complicated with some other cause, such as apoplexy, &c., and this fact makes the adoption of my rule all the more necessary.

It is always a wise thing to especially note the position and surroundings of the body of an insensible person, for if the case should turn out to be a suspicious one, and foul play were suspected, you, being the first person to have discovered the body, might be severely cross-examined upon these points before the coroner or magistrate.

I shall not attempt to give you the different symptoms arising from these several causes, but simply give you a few rules that you may always safely remember and carry out in almost all cases of insensibility.

1.—*Place the body on the back, with the head raised.*

2.—*Undo all the clothing round the neck.*

3.—*Allow a free circulation of air round the patient.*

4.—*Remove patient as quickly as possible to the nearest hospital or medical man's house, and the best means of conveyance is undoubtedly the Stretcher, of which I shall speak in my last lecture.*

If you should find a person suffering from an *epileptic fit*—which you would be able to recognise by the convulsive spasms of the limbs and body, the contorted and congested face, the foaming at the mouth, and the bitten tongue—you should act on the rules just mentioned; but besides these you should do all in your power to prevent the patient injuring himself, being careful, however, not to attempt to restrain his movements, as by so doing you often only aggravate all his struggles. Place, then, something soft under his head, put something between the teeth to prevent further injury to the tongue, and watch carefully till the fit is over, and then remove him at once as before mentioned.

In cases of *fainting* we should at once lay the patient flat, and *the head should be brought to the same level with the body*, so as to enable the blood to more easily circulate through the brain, for it is this want of power in the heart to propel the blood to the brain that has caused the insensibility. If bleeding is going on, that of course must at once be arrested by the rules given under hæmorrhage. Eau de Cologne, sal volatile, ammonia, &c., may be all used, but the important thing to remember in these cases is undoubtedly the question of position of the head and body. Stimulation, however, is apt to start afresh the hæmorrhage arrested by fainting. Brandy given too freely causes the patient to lose more blood.

With regard to the especial treatment of cases of insensibility arising from *narcotic poisoning*, I shall speak of that when I come to the consideration of poisoning generally.

In cases of absolutely certain intoxication, where there can be no doubt whatever that that is the cause of the insensibility, from the history given by the patient's friends or others, the treatment consists in emetics (which will be spoken of under the heading of treatment of cases of poisoning), cold water applied to the head and warmth to the surface of the body and extremities.

Before leaving this subject, I may mention that if you notice any blood coming from the ears or ear of an unconscious person, you may be almost sure that it is a case of fracture of the bottom part or base of the skull.

The next subject which claims our attention is that of

POISONS.—It is not easy to find a more difficult word in the English language to define properly than the word poison. Almost all medicines are poisonous if taken in sufficiently large dozes, and even common salt in an excessive quantity has been known to have caused death. I shall content myself, however, with defining poison "as a substance which, through the blood, has a deadly or noxious action upon living beings." Some poisons act and kill almost in a moment, whilst others take a much longer time. The former we call deadly poisons. For the sake of clearness we divide all poisons into three classes.

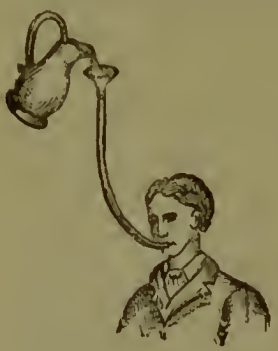
1.—IRRITANT POISONS, and these produce irritation and inflammation, destroying the tissues with which they come in contact and causing great pain, as the *mineral acids*, *mercury*, *arsenic*, &c.

2.—NARCOTIC POISONS, these producing stupor and absolute insensibility by their action upon the brain, as *opium*, *morphia*, &c.

3.—NARCOTICO-IRRITANT POISONS, these combining

the action of both the former, as *strychnine*, *belladonna*, the *poisonous fungi*, &c.

Now, if any of you should happen to be the person nearest at hand in any case of poisoning, and especially if there be any likelihood of the case being the subject of a coroner's or magistrate's inquiry—be sure and at once note the position and the surroundings of the patient; as well as at the same time noticing whether any bottles likely to have contained the poison are in the room or near at hand. Send then at once for the nearest medical man, and proceed immediately to *get the poison out of the stomach as soon as possible*, and this must be done by encouraging vomiting. Vomiting is, as a rule, one of the first and most important signs of poisoning; and such being the case, it is often only necessary to foster this tendency by copious and large draughts of warm water. If, however, vomiting be not present, then we must at once administer an emetic. The best medicinal emetic is undoubtedly sulphate of zinc in twenty to thirty grain doses, but in all probability you will not have this at hand. Ipecacuanha wine is, as a rule, a medicine you will find in most houses, and two table-spoonfuls of this with warm water is often quickly efficacious. If we have not this,



however, we must resort to mustard and water, which proves an excellent substitute; a tea-spoonful or two being given in warm water and frequently repeated. Common salt and water may

be used with good effect; and vomiting may also be excited by tickling the back of the throat, as well as by the free use of hot greasy water.

The stomach pump cannot of course be used except by a surgeon; but an excellent substitute can be made and easily and safely used, if the patient is at all conscious, by means of a piece of elastic gutta percha tubing, about three yards in length and half-an-inch in diameter. You make the patient swallow about from twenty to twenty-five inches of this, and you will find this much more easily accomplished than you would think. You then hold the free end of the tube above the patient's head and pour down through a funnel a pint or two of warm water, which, of course, goes direct into the stomach. By lowering now the free end the stomach empties itself readily, and this being frequently repeated, the cavity of the stomach is completely washed out.

The *narcotic poisons*, such as *opium* and *morphia*, require, besides this immediate treatment, something more. You will find in these cases a great and overwhelming tendency to *sleepiness* and *drowsiness*, and this *must be guarded against*. Once allow a person poisoned by opium to become insensible, and there will be comparatively little chance of recovery. You must not relax for one moment in your efforts to stop this sleep getting the better of the patient. Walk him briskly about. If he cannot walk, drag him about, throw cold water in his face; irritate his legs and feet by hitting them with a wet towel; administer strong coffee, and in fact do all in your power, however cruel it may seem at the time, to keep your patient awake. If, however, these all fail, and the unconscious state comes on, then you must have recourse to artificial respiration, of which you will hear when I come to the question of the "Restoration of the apparently drowned."

In cases of *irritant poisoning* you will generally find

a disposition to vomiting, but this should not be encouraged by emetics. Acids and alkalies form antidotes to each other, and the acids best suited for this purpose, and usually at hand, are vinegar, orange-juice, and lime or lemon-juice, of course mixed with water; while the alkalies are, soda, potash, magnesia, or lime, also mixed with water. Demulcent drinks, such as milk, barley water, should be given, and white of egg, salad oil, and castor oil, may be used with great advantage in these cases, so as to protect the gullet and walls of stomach from further damage.

With regard to the other poisons and their several antidotes, I shall not attempt to bother you with these; always bear in mind that the great thing is to encourage and keep up vomiting in all cases of poisoning, except in poisoning by irritants, until the arrival of a medical man; and you may then rest contented that you have done all that you could have been expected to.

LECTURE V.

DROWNING, *and the directions for the restoration of the apparently drowned.* SUFFOCATION BY GASES. SUNSTROKE. CHOKING.

I cannot imagine any more harrowing scene than one of which I was a witness some years ago, when a small schoolboy; and yet how often is such a scene enacted. A little child, taken from a mill stream, into which it had accidentally tumbled, with its life almost gone, the mother and father and others, together with myself and school-fellows, standing round, none knowing what to do. The piteous cries of the mother for help, and the full knowledge that the little life ought to be saved, but by what means none standing there knew, were terrible; and in a few moments it might be too late to do anything. No medical man within miles—and so a life was lost through want of proper knowledge. This scene so impressed me that I at once took an interest in the subject of the means of restoring the apparently drowned; and the consequence was that a few years afterwards, when quite a youngster, I, through the knowledge then acquired, was instrumental in saving the life of a young man who had been taken from the water apparently dead. Surely with the probability of having some time or other the chance of being the means of restoring to life some person thought to be drowned, you will listen attentively and make yourselves thoroughly conversant with the rules I shall now give you how to bring about the much to be desired end. They are those which have been so admirably and clearly drawn up by the "Royal National Lifeboat Institution," and are as follow:

DIRECTIONS FOR RESTORING THE APPARENTLY DROWNED.

The leading principles of the following directions for the restoration of the apparently dead from drowning are founded on those of the late Dr Marshall Hall, combined with those of Dr H. R. Silvester, and are the result of extensive enquiries which were made by the Institution in 1863-4 amongst medical men, medical bodies, and coroners throughout the United Kingdom. These directions have been extensively circulated by the Institution throughout the United Kingdom and in the Colonies. They are also in use in Her Majesty's Fleet, in the Coastguard Service, and at all the stations of the British Army at home and abroad.

I.—Send immediately for medical assistance, blankets, and dry clothing; but proceed to treat the patient *instantly* on the spot, in the open air, with the face downward, whether on shore or afloat; exposing the face, neck, and chest to the wind, except in severe weather, and removing all tight clothing from the neck and chest, especially the braces.

The points to be aimed at are—first and *immediately* the RESTORATION OF BREATHING; and secondly, after breathing is restored, the PROMOTION OF WARMTH and CIRCULATION.

The efforts to *restore Breathing* must be commenced immediately and energetically, and persevered in for one or two hours, or until a medical man has pronounced that life is extinct. Efforts to promote *Warmth* and *Circulation*, beyond removing the wet clothes and drying the skin, must not be made until the first appearance of natural breathing; for if circulation of the blood be induced before breathing has recommenced, the restoration to life will be endangered.

II.—TO RESTORE BREATHING.—*To clear the Throat.*—Place the patient on the floor or ground with the face downwards, and one of the arms under the fore-

head, in which position all fluids will more readily escape by the mouth; and the tongue itself will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth.

Expiration.

DR MARSHALL HALL'S METHOD.

If satisfactory breathing commences, use the treatment described below to promote Warmth. If there be only slight breathing—or no breathing—or if the breathing fail, then—

To Excite Breathing.—Turn the patient well and instantly on the side, supporting the head: and

Inspiration.

DR MARSHALL HALL'S METHOD.

Excite the nostrils with snuff, hartshorn, and smelling salts, or tickle the throat with a feather, &c., if they are at hand. Rub the chest and face warm, and dash cold water, or cold and hot water alternately, on them. If there be no success, lose not a moment; but instantly—

To imitate breathing—Replace the patient on the face, raising and supporting the chest well on a folded coat, or other article of dress.

Turn the body very gently on the side and a little beyond, and then briskly on the face, back again; repeating these measures cautiously, efficiently, and perseveringly, about fifteen times in the minute, or once every four or five seconds, occasionally varying the side.

[*By placing the patient on the chest, the weight of the body forces the air out; when turned on the side this pressure is removed and air enters the chest.*]

On each occasion that the body is replaced on the face make uniform but efficient pressure, with brisk movement on the back between and below the shoulder-blades or bones on each side, removing the pressure immediately before turning the body on the side.

During the whole of the operations let one person attend solely to the movements of the head and of the arm placed under it.

The first measure increases the expiration—the second commences inspiration.

The result is *Respiration* or *Natural Breathing*,—and if not too late, *Life*.

Whilst the above operations are being proceeded with, dry the hands and feet; and as soon as dry clothing or blankets can be procured, strip the body, and cover or gradually reclothe it; taking care not to interfere with the efforts to restore breathing.

III.—Should these efforts not prove successful in the course of from two to five minutes, proceed

to imitate breathing by Dr Silvester's method, as follows :—

Place the patient on the back on a flat surface, inclined a little upwards from the feet; raise and support the head and shoulders on a small firm cushion or folded article of dress placed under the shoulder-blades.

Draw forward the patient's tongue and keep it projecting beyond the lips: an elastic band over the tongue and under the chin will answer this purpose, or a piece of string or tape may be tied round them, or by raising the lower jaw the teeth may be made to retain the tongue in that position. Remove all tight clothing from about the neck and chest, especially the braces.

To Imitate the Movements of Breathing.—Standing at the patient's head, grasp the arms just above

Inspiration.

DR SILVESTER'S METHOD

the elbows, and draw the arms gently and steadily upwards above the head, and *keep them stretched* upwards for two seconds. (*By this means air is drawn into the lungs*). Then turn down the patient's arms, and

press them gently and firmly for two seconds against the sides of the chest. (*By this means air is pressed out of the lungs*).

Expiration

DR SILVESTER'S METHOD.

Repeat these measures alternately, deliberately, and perseveringly about fifteen times in a minute, until a spontaneous effort to respire is perceived; immediately upon which cease to imitate the movements of breathing, and proceed to induce circulation and warmth.

IV.—TREATMENT AFTER NATURAL BREATHING HAS BEEN RESTORED.—*To Promote Warmth and Circulation.*—Commence rubbing the limbs upwards with firm grasping pressure and energy, using handkerchiefs, flannels, &c. (*By this measure the blood is propelled along the veins towards the heart*).

The friction must be continued under the blanket or over the dry clothing.

Promote the warmth of the body by the application of hot flannels, bottles, or bladders of hot water, heated bricks, &c., to the pit of the stomach, the arm-pits, between the thighs, and to the soles of the feet.

If the patient has been carried to a house after res-

piration has been restored, be careful to let the air play freely about the room.

On the restoration of life a teaspoonful of warm water should be given; and then if the power of swallowing has returned small quantities of wine, warm brandy-and-water, or coffee should be administered. The patient should be kept in bed, and a disposition to sleep encouraged.

General Observations.—The above treatment should be persevered in for some hours, as it is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance; persons having been restored after persevering for many hours.

Appearances which generally accompany Death.—Breathing and the heart's action cease entirely; the eyelids are generally half closed; the pupils dilated; the tongue approaches to the under edges of the lips, and these, as well as the nostrils, are covered with a frothy mucus. Coldness and pallor of surface increase.

Cautions.—Prevent unnecessary crowding of persons round the body, especially if in an apartment.

Avoid rough usage, and do not allow the body to remain on the back unless the tongue is secured.

Under no circumstances hold the body up by the feet.

On no account place the body in a warm bath unless under medical direction, and even then it should only be employed as a momentary excitant.

I may here mention, that unless more than one person be present, Dr Marshall Hall's method should never be attempted, as it is absolutely imperative that some one should look after the head and the arm under it during the efforts to restore breathing by this process.

I myself much prefer Dr Sylvester's process as the much easier and safer method of the two; but care should be taken always to clean the mouth out well, and keep the tongue also well forward before commencing artificial respiration by this method.

SUFFOCATION BY GASES.—The treatment to be adopted in all these cases is to remove the patient immediately to the fresh air; to dash cold water in the face and on the chest; to keep up the warmth of the body, and apply mustard plaisters over the heart and round the ankles. If these means fail, then without loss of time try artificial respiration, as already described.

SUNSTROKE.—In these cases the patient should at once be taken to a cool and shady place; cold water should be freely dashed over head and face, the body being laid flat, with the head well raised. All tight clothing should be removed at once from the neck and chest, and the *use of stimulants* should especially *be avoided.*

Of course in both these cases the assistance of a medical man should at once be procured.

CHOKING is not a very rare accident, and nothing is so likely to alarm anyone as this occurrence. When a person has a fish bone or other substance in the throat, the best thing to do is to at once insert a finger into the mouth and press upon the root of the tongue, so as to induce vomiting. If this fails, let the patient swallow a piece of soft bread. If the substance can be felt by the finger, then insert two fingers into the mouth and bring it away, using, of course, the safeguard of putting some hard substance between the teeth, unless you have a desire to be severely bitten. In these cases also a medical man should at once be sent for.

LECTURE VI.

BANDAGING. REMOVAL OF INJURED OR SICK PERSONS *by Bearers, Stretchers, Country Carts, or by Trains.*

BANDAGING.—There is nothing more difficult to attempt clearly to describe, than the way, or rather the different ways, of applying a bandage. A practical lesson will do more in half-an-hour than a very lengthy description occupying much time; but as I have been told that these Lectures would not contain what was requisite, unless this subject were introduced, I must get to my difficult task; and must ask you to excuse, under the circumstances, all shortcomings on my part to make this matter clear.

Bandages are generally made of unbleached calico, of flannel, linen, &c., and are used for different purposes. Sometimes they are used as supports to the different parts of the body; again, we use them in order to apply pressure; also for fixing splints, dressing, &c.; and lastly, for the purpose of allaying muscular action.

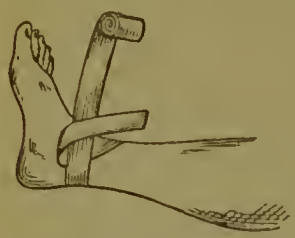
The chief kinds of bandages are the *Roller* and the *Triangular Bandages.*

The Roller Bandage.—Now what are the usual sizes and lengths of these bandages? I cannot do better than arrange this in a table, where you will be able to see at a glance what is required.

	Width.	Length.
Finger bandages, . . .	¾ inch.	1 yard.
Arm ,, . . .	2½ inches.	3— 6 yards.
Leg ,, . . .	3 ,,	6— 8 ,,
Chest ,, . . .	4—5 ,,	8—12 ,,
Head ,, . . .	2½ ,,	4— 6 ,,

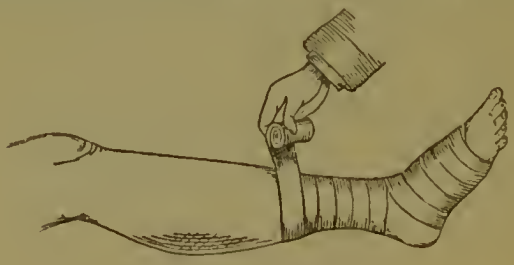
The next thing to know is, *How to roll a Bandage?* You first fold one end of your bandage two or three times as tightly as you can, thus making it into a small roll. You now take hold of this by the fingers of both hands, both thumbs being placed on the top of it, while the rest of the bandage is, if possible, held by another person, who keeps it moderately strained. The thumbs now by an alternate movement make the roll revolve on its own axis, the fingers at the same time holding it in position between the two hands. When it is all rolled up, and if not wanted for use at once, the end should be fastened by a stitch or pin, to prevent unrolling.

How to apply a Roller Bandage.—We may apply a roller bandage in three different ways, and these are called as follows:—1, a *simple spiral bandage;* 2, a *reverse or recurrent bandage;* 3, a *crucial or figure-of-8 bandage* Let me now describe these separately. It is a wise plan in all these three ways of using a roller bandage, when first applying the bandage, to leave the end a little long, and then, when the first turn is made, by turning this end over, and, bandaging over this again, it is kept firm and prevented from slipping.



First application of a Roller Bandage.

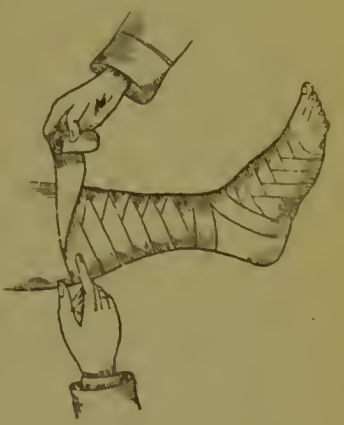
The Simple Spiral Bandage.—The application of this



Simple Spiral Bandage.

bandage consists in simple spiral turns as shown, each turn overlapping the preceding one to the extent of about two-thirds of the width of the bandage. It is, however, so apt to slip, that we usually have recourse to

The Reverse Spiral.—This is applied like the former, except that the bandage is turned back upon itself each time it is carried round the limb, as shown. This form of applying a bandage is one that is not at first easily learnt, and requires a good deal of practice before it can be neatly and nicely done. The thumb or forefinger of the hand *not* holding the bandage, should be placed upon the bandage at the part where the turn is to be commenced, while the other hand turns the bandage back upon itself.



Reverse Spiral Bandage.

The Crucial or figure-of-8 Bandage.—This form of applying a bandage is usually used at the joints, and it is always used when you apply a bandage over the ankle-joint in bandaging from the foot up the leg. You carry the bandage over the upper part of the joint, then down, under, and across the lower part, and then up over the upper part again, thus forming a regular figure-of-eight.

I will now give you a few rules that always ought to be observed in using the roller bandage.

1.—Bandage from within outwards.

2.—Commence bandaging from below, and work upwards.

3.—Take care that the pressure is evenly and uniformly applied, but not too lightly.

4. Avoid all wrinkles in your bandage.

5.—In reversing, or turning a bandage over, always do so on the fleshy side, and not over the sharp edge of a bone.

How do you fasten a bandage after it is applied? You can do this in three different ways—firstly, by putting a stitch in it; secondly, by pinning it; and thirdly, by tearing the bandage down the centre for a little distance, and then turning one end round one way and the other in the opposite direction and tying these two ends. This last is an untidy and clumsy way of doing things, and should not be resorted to unless no pin is at hand. The stitch is by far the best and neatest way of fastening a bandage.

We are now come to the consideration of the

Triangular Bandage.—Professor Esmarch has introduced this form of bandage, and its usefulness will be readily acknowledged when I tell you that it can be applied in no less than thirty-two different ways. The dimensions of this bandage are as follows:—Its lower border measures four feet, and the two side borders two feet ten inches each. If this bandage is not at hand, a large-sized pocket-handkerchief, folded from corner to corner, or cut across in that direction, will answer the purpose.

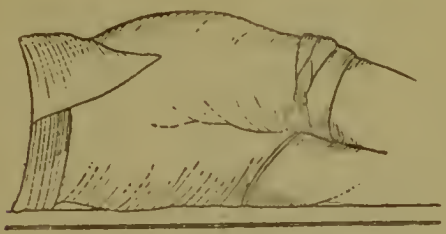
A triangular bandage, with figures, illustrating the different modes of applying it, can be obtained from the Ambulance Department of the Order of St John at a trifling cost. It is applied either folded, like a neck-handkerchief, or unfolded; and in folding it as a neck-handkerchief it may be made narrow or broad as required. I have given a few diagrams of some of the modes of applying this bandage, but time will not permit my describing all the different ways it can be used.

We now come to the most important part of this Lecture, viz.:—

TRIANGULAR BANDAGES AND THEIR APPLICATIONS.

To Head, to Chest and to Hand.

To Head and Face, and to Arm as a Sling.



To Hip—one going round Waist and the other round Hip.

To Foot.

THE REMOVAL OF THE INJURED OR SICK BY BEARERS, STRETCHERS, COUNTRY CARTS, OR BY TRAIN.

And I will first describe the

CARRIAGE BY BEARERS.—If no stretcher or other conveyance can be procured or improvised, you can in this way transport an injured person for a short distance, and the methods of so doing, which I shall now describe, are those drawn up and advocated by Professor Longmore. If *only one person be available*, and if the patient can stand up, great help may be afforded him by letting him place one of his arms round the neck of the bearer, bringing his hand on and in front of the opposite shoulder of the bearer. The bearer then places his arm behind the back of the patient and grasps his opposite hip, at the same time catching firmly hold of the hand of the patient placed on his shoulder with his other hand. Then by putting his hip behind the near hip of the patient much support is given, and, if necessary, the bearer can in this way lift him off the ground, and, as it were, carry him along. If, however, the patient cannot stand, the only way in which one person can remove him is by getting him on his back; but this method is, of course, not practicable in a case where the thigh is broken.

If two bearers are, however, available, the patient may be carried by them in three or four different ways:—

1.—He may be carried in a sitting position by the two bearers joining

two of their hands underneath his thighs, close to the buttocks, while their other two hands are passed round his loins and clasped together. The patient, if he is able, can help to support himself by clasping the bearers round their necks.

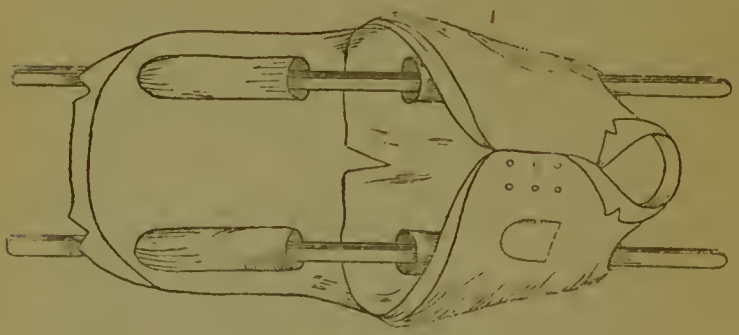
2.—A patient can be carried by two bearers, as shown in cut, two of their hands forming a seat and the other two arms a back support.

3.—As shown in cut, three of their hands forming the seat, while a back support is made by the remaining arm.

4.—As shown in cut, a seat may be made with all four hands, and this form of seat is well known among schoolboys as the "sedan chair." If the patient is able to sit up and help to support himself by placing his arm over the shoulders of the bearers, it is surprising how long a distance he may be carried by this method.

We now come to the consideration of

THE CARRIAGE OF PATIENTS ON STRETCHERS.—You all know what a stretcher is, so I shall not go into the description of the different sorts of stretchers that are used, merely remarking that for the St John Ambulance Association a stretcher and wheeled ambulance has been devised which obtained the medal of the Sanitary Institute of Great Britain, as also the prize medal at the Brussels Exhibition. It is a most useful conveyance for colliery districts, railways, and for street accidents. The Metropolitan Police have now adopted this litter as their regular ambulance, and have it at their stations for the use of the public. All information concerning this can be obtained from the Secretary of the Association at St John's Gate, Clerkenwell. If we have no regular stretchers at hand, we must extemporize one, and among the many substitutes, I may mention a door or gate taken from its hinges, a window shutter, a hurdle, or even a short ladder. If two poles of



sufficient length and strength can be obtained, a stretcher can be readily made with them, together with two coats, as shown. The sleeves of the coats are turned inside out, and the poles being put through them, as shown in the drawing, and the coats having then been buttoned up, a very suitable stretcher is at your

service. I shall now describe in their order the rules to be adopted with regard to the proper carriage of patients on stretchers, and these same rules hold good whatever stretcher is used and however many bearers are required. I shall also tell you the words of command which are used in the British Army for the stretcher drill; because I feel sure that by learning your work in this way you will be less likely to forget any of the rules, and by acting together at the word of command you will secure additional comfort and safety to the patient you may have to carry.

1.—As regards the Bearers. It is best to have three persons to carry an ordinary stretcher (though of course if you are using a door or shutter you would probably want five). Of these three, two carry the stretcher and the other one attends solely to the patient, changing when necessary with either of the other two by way of relief. For convenience sake, the bearers are called by numbers. The bearer who marches in front is No. 1, the one who marches behind No. 2, and the one who looks after the patient No. 3.

2.—As regards Placing the Stretcher. Now I am certain that nine out of every ten persons who had never been instructed in stretcher drill would place the stretcher in the wrong position. It should be brought close to the patient, and *not* be laid at his side, but *placed at his head, and the length of the stretcher should be in the same direction as that in which the injured person is lying.* If otherwise placed it gets in the way of the bearers' feet, and there is a chance of stumbling over it and perhaps letting the patient fall.

3.—Placing a Patient on the Stretcher. As soon as you have your patient ready for moving, as for instance the broken leg put in splints, &c., No 2 gives the word of command, "Fall in." Nos. 1 and 2 now

take up their positions, facing each other on the opposite sides of the patient near the haunch bones, and No. 3 falls in on the side of the injured limb. No 2 now gives the word "Ready." Nos. 1 and 2 stoop down and get each one hand under the back of the patient, near the shoulder blades, and lock them; and their other hands are now passed under the upper parts of the thighs and clasped. No 3 all this time attending solely to the injured limb. The word "Lift" is now given, and the bearers slowly rise, and when upright, and at the word "March," they slowly march by short steps until the head of the patient is over the pillow on which it is to rest. The order "Halt" comes now, followed by "Ready" and "Down," when the bearers slowly lower the patient on to the stretcher.

4.—STARTING WITH STRETCHER. After the patient is on it the word of command is given, "Fall in," and Nos. 1 and 2 then get into their positions at the head and foot of the stretcher, and at the word "Ready" they adjust the shoulder straps and take hold of the handles of the stretcher. Then comes the word "Lift," and they slowly and steadily raise the stretcher.

5.—MARCHING WITH THE STRETCHER. Now this is most important, for unless a simple rule be always observed in carrying a stretcher, the poor patient may he rolled about from side to side, much to his discomfort and increase of pain; for if each of the bearers march off with the same foot what happens? Why of course at each inclination of the bodies from side to side, the stretcher rolls slightly over; just as the camel, who walks off with the right hind and front legs and then the left, rolls its unfortunate rider from side to side in a most unpleasant manner, as all must well know who have ever been obliged to sit upon these ungainly creatures' backs. How then is this to be obviated?

Why simply by the bearers "breaking step," i.e., *If No. 1 marches off with the right foot, No. 2 must march off with the left, and vice versâ.* By doing this the stretcher is kept comparatively steady. The step in marching must be a short one, and there must be no springing from the feet. The knees should be kept slightly bent, and the hips should move as little as possible. The gait of the Italian hawker, you often see, carrying a large basket of images on his head, is the one to be copied by the bearers of a stretcher.

6.—HALTING AND LAYING DOWN A STRETCHER. The word of command "Halt" is given, then "Ready," and the bearers now get into the position to stoop. The word "Down" follows, and the stretcher is slowly and steadily lowered. "Fall out," and the bearers get themselves free from the stretcher.

The patient is lifted from the stretcher in the same way that he is lifted from the ground on to it.

I shall now give you a few more rules, which you must try to remember, as they are all of importance.

(*A*). *Never allow a stretcher to be carried on the shoulders*, for you may easily have an accident by the patient rolling off; or again, the poor creature might die during the transit without your knowing it, and also the patient would be too high up for No. 3 to pay proper attention to the injured limb.

(*B*). *Avoid, if possible, crossing fences, ditches, walls, &c.*

(*C*). *In going up a hill let the patient's head be in front*, except when he has a broken leg or thigh, and then the order is reversed, so as to prevent the weight of the body from pressing down upon the injured part.

(*D*). *In going down a hill let the patient's head be behind*, except in cases of a broken leg or thigh,

when this position is reversed, for the reason given above.

(*E*). *Always try and get bearers of the same height;* if not, be sure they adjust the shoulder straps so as to carry the stretcher as level as possible.

If the patient has to be taken any considerable distance it becomes impracticable that he can be carried by the stretcher; and this brings me to the subject of

THE CONVEYANCE BY COUNTRY CARTS.—Now, if you have already got your patient on a stretcher, this should be lifted into the cart, with the help of an additional person in the cart. The stretcher should then be slung within and from the sides of the cart, and in doing this great care must be taken that the lashings are well secured, at the same time not having them too tight or too loose. Should you, however, not have a stretcher at hand, then the bottom of the cart should be filled with straw, hay, rushes, ferns or some other soft material, and the patient laid carefully on this.

With regard to the

CONVEYANCE BY TRAIN. I may say that here also, if the patient be already on a stretcher and it is not too wide to be easily got through the doorway of the carriage, then by placing two cross supports of strong wood upon the opposite seats, one or two stretchers can then be placed longitudinally on each seat, or the guard's van, or even a luggage compartment might be used. If, however, the patient be not on a stretcher, then you can very easily make a comfortable seat for him to lie upon; and the large second-class carriages are the best suited for the purpose. Common sense will dictate to you the best ways of lifting a patient into a railway carriage; always, however, bear-

ing in mind that one person should be told off to carefully look to the injured limb, if any; and also that the patient should be always, if suffering from a fractured limb or severe wound, attended to by the rules I have already laid down, before his removal from the place of accident.

LECTURE VII.

NURSING — POULTICE-MAKING; *application of* BLISTERS, LEECHES, FOMENTATIONS; VAPOUR BATHS; LIFTING *helpless patients;* CHANGING SHEETS, *etc.*

Can there be a more loving, sympathetic task than that of nursing the sick? If ever the good feelings and kindliness of heart of a person have an opportunity of showing themselves, surely it is in the occupation of nursing. How many have voluntarily given their whole lives up to this loving profession, and have gone down to their last resting-place honoured, beloved, and revered? Now let me try and give you my idea of a good nurse. Possibly you will think me rather hard to please, but I feel sure that all the good qualities I am about to enumerate are almost absolutely necessary. She must, then, be clean, tidy, and neat, both in her appearance and her work; she must have tact and judgment, and be able quickly to discern the temperament of her patient; she must be firm, yet not domineering, gentle and kind, yet at no time giving way; and she must be attentive to the medical man's instructions and watch carefully all the different symptoms of the patient, so as to be able to answer the doctor's questions at his next visit. Now when a doctor gives his orders of what he wants the nurse to do, it is of course essential that she should know at once how to carry out these instructions. She has to apply a poultice, or may be leeches; possibly, too, a blister is ordered or hot water fomentations; or, again, a vapour bath may be deemed expedient. Then a nurse should

know how she can best lift or lay down a helpless patient, how she can make or re-make the bed, change the sheets, &c. Now to do all these things and to do them properly requires not only the knowledge of how they may be done, but also the proper method of doing them. Let me begin, then, by describing the proper method of making

POULTICES—In making all poultices you should remember to have all your things at hand ready for use and placed before a nice fire to be thoroughly warmed. Method and rapidity of action are essential to the proper making and application of poultices. In re-applying poultices always remember not to remove the old poultice until you have the new one quite ready to replace it. In order that the poultice should retain its heat it ought to be spread at least an inch thick; but in some cases, where a heavy poultice cannot well be borne, then you can make it thinner, and cover it externally with a layer of cotton wool. They are simply local baths applied to the skin, and are usually made of linseed meal, mustard and linseed meal, bread, carrots, charcoal, &c. Of these undoubtedly the commonest is a

LINSEED MEAL POULTICE.—This is best made by pouring boiling water into a bowl or basin and then sprinkling quickly the meal into it, at the same time stirring the mixture constantly until a thin smooth dough is formed. The poultice should always be made with boiling water, and as rapidly as possible to prevent its cooling. If the water be added to the meal, instead of the meal to the water, you will find it most difficult and almost impossible to prevent your poultice being lumpy, and consequently not at all agreeable to your patient. Having your linen cut to the requisite size and warmed, you now spread the dough quickly and evenly over its surface, leaving about an inch of free edge of linen all the way round, and this free edge you turn

over the meal, and by so doing ensure a neat poultice, readily applied and easily removed.

Bread Poultice.—Slices of bread are put into a basin and boiling water poured over them, and this is placed by the fire. After a few minutes you pour the water off, replacing it again by more boiling water. You now pour this off, and after pressing the bread with a fork until it is of the proper consistence, you spread this on the linen as before described.

Mustard and Linseed Meal Poultice.—For this you want three things besides your linen, viz., mustard, linseed meal and boiling water. Equal parts of mustard and linseed meal are frequently used, but of course this is not imperative, and the medical man will tell you how much mustard he wants used in the poultice. You mix the linseed meal and mustard well together dry, and then, when thoroughly mixed, you sprinkle this into the boiling water, constantly stirring as before described. The spreading and applying is the same as other poultices.

Charcoal Poultice.—This is used frequently for preventing offensive smells from bad sores, as also for promoting a more healthy action of the part. The charcoal mixed with bread and boiling water is the best form, but the surface of the poultice should always be sprinkled with charcoal as well before it is applied.

Carrot Poultice.—This is a very popular form of poultice, and is supposed to make wounds cleaner, and consequently to help the healing process. You simply boil some carrots till they are quite soft, and after having mashed them well with a fork, you spread the pulp on linen in the ordinary way.

A substance called Spongio Piline is an excellent substitute for a poultice. It is made of sponge and wool, felted together, and backed by indiarubber or some other impermeable substance. By moistening the soft part with boiling water, and quickly applying it to the part, it answers very well, though I should always

myself prefer a good well-made linseed meal poultice, as being much more soothing. This spongio piline is particularly useful, however, if a poultice is required to be worn by a person who is able to be about, as it retians its heat very well and is a very clean application.

Cotton Wool thoroughly warmed and applied quickly to the part answers also remarkably well, and is an admirable application after the removal of a linseed meal poultice, but of course would not do for any wounded surface.

Mustard Plaisters are often ordered as a quick counter-irritant. The mustard for this purpose should be always mixed with *cold* water, and care should be taken that it is fresh and good. This may be known by the pungent fumes that are given off whilst you are mixing it with the water. The mustard, having been well mixed with the water into the consistence of a paste, should be spread on a piece of brown paper, and over this a piece of thin tissue paper or fine muslin may be laid, so as to intervene between the mustard and the skin. In making mustard plaisters always remember that boiling water or vinegar should not be used, as they destroy the active property of the mustard.

BLISTERS are often ordered, and are either in the form of a liquid to be painted over the part, or in the form of a plaister already spread. If in liquid form it should be applied with a camel's hair brush over the part, care being taken not to have the brush too wet. After it has dried a small layer of cotton wool may be placed over the surface. To apply the blister in the plaister form, it should be warmed for a moment before a fire and quickly applied. Unless other directions are given, you need not remove it for twelve hours, when it should be dressed. The plaister is then raised from one side and removed, and the blebs are opened with a pair of scissors. After this has been done some simple ointment spread upon lint should be applied, and

renewed twice or three times daily. A very popular application after a blister has been removed is a cabbage-leaf dipped in warm water. Sometimes when a blister is removed you will find that the blebs have not risen at all well, and then you should apply a soft linseed meal poultice, which soon has the effect of making them rise. Occasionally the raw surface caused by the blister is ordered not to be healed up, and this is done by removing all the old skin and then dressing it with some other forms of ointment according to the doctor's directions.

FOMENTATIONS are applications of hot water, and these may be simple or medicated by the addition of any drug. After dipping a piece of flannel in boiling water you next proceed to wring it nearly dry, and this is best done by means of a wringer made of stout towelling attached to two pieces of stick. The flannel is put in this, and the wringer is twisted round until the water is thoroughly squeezed out. If you have no wringer at hand, a common towel will answer the purpose. When wrung thoroughly dry, these fomentations may be used very hot indeed, without any fear of scalding or blistering the skin. After having applied it over the part, it is best to cover it outside with a piece of mackintosh, by which means it retains the heat much longer. After you remove the flannel be sure and wipe the skin dry, and then cover the part over with some more flannel or cotton wool, otherwise there might be danger of catching cold. *Turpentine fomentations* are applied in exactly the same manner, with the simple addition of a little of the oil of turpentine sprinkled over the flannel after it has been wrung out. Laudanum or any other drug, by the direction of the medical man, can be sprinkled over the flannel in the same way.

LEECHES.—The application of these useful little animals requires some little skill and attention, as also

often much patience. They are employed, as you must all know, to draw blood from the part to which they are applied. The skin must be always first washed thoroughly clean with soap and hot water, and the soap then washed off with cold, and the skin wiped nice and dry. A very good way to apply leeches is as follows: Take a wine glass, and over the mouth spread lightly a piece of linen or a handkerchief, and put the leeches into the hollow and apply to the part; by straining the linen and keeping the wine glass applied against the skin, the leeches soon bite. Another way is to put them in a small box, and by inverting it over the part they often readily take. Again, you may take them between your finger and thumb and direct the head to the part. Leech glasses are often used, but are seldom necessary, except you have to apply them to the mouth. These glasses are tubes of the size of the leech, and the animal is inserted with the head towards the small end of the tube, and so applied. When the leeches are full they soon drop off. It is more or less dangerous to attempt to pull them off, as sometimes the teeth might be left behind and set up inflammation. If the temperature of the part to which you wish to apply them is high, it is wise to put them into tepid water first. After the leeches have dropped off, the part should be well bathed with warm water, and if more blood is required to be taken, a nice hot poultice should be applied. Sometimes leech bites bleed very freely; usually pressure with the fingers or a small compress will stop the hæmorrhage; should this fail, however, you had better send for a medical man. You may want to use leeches a second time, and, if so, the best way to preserve them is to sprinkle some salt over them, which proceeding soon makes them empty themselves of the blood, and after having washed them in cold water a few times, you had best put them in a vessel half full of water and covered with a piece of perforated cardboard.

VAPOUR BATHS.—There are many apparatuses for giving patients hot-air baths, and I shall not attempt to describe these; but it sometimes happens that it is absolutely necessary to get the skin to perspire very quickly and thoroughly, and if no such apparatus is at hand, what is to be done? If it be a child a warm bath and wrapping up in flannel blankets will often suffice; but in the case of adults, if they be helpless or in the houses of the poor where no baths are to be found, what can be substituted? For this Sir James Simpson devised a most excellent bath, always easy to construct and capital in its action. For it you only want a few soda water bottles filled with hot water and tightly corked down, and these are wrapped round with pieces of flannel or worsted stockings, wrung out in hot water. These then are placed round the patient in bed and he is well covered up. In about half-an-hour you will find a thoroughly free perspiration. The bottles can now be taken away and the patient wrapped up in a flannel blanket for another half hour. If the bed during this process has got at all wet you must remove him to another bed, which has, of course, been thoroughly well aired and warmed. In case no soda water bottles are at hand hot bricks answer very well. In cases of croup, as also in certain cases of bronchitis, a medical man often wishes the patient to be kept, for at least some time, in an atmosphere of steam, and it is often difficult to know how to do this in the quickest and easiest way, unless you have a regular steam bed and appliances. In the case of children a very good way is to put them in a cradle under a fairly sized table, then covering this over on all sides with sheets, to place under it at the foot of the cradle a vessel with boiling water, which is, of course, to be continually replenished. By this means you can always readily carry out what often appears a difficulty.

LIFTING HELPLESS PATIENTS.—You may

often want to lift some poor helpless patient, who has been rendered utterly unable to help him or herself through paralysis, accident, or prostration, and it is a useful thing to know the different methods by which you can easily and readily accomplish this. One person can quite comfortably carry a child, but when the patient is an adult it is different. Two persons can manage this in the following way: They take their stand at each side of the patient, about opposite the buttocks, and stooping down they join their hands under back and middle part of thighs, and in this way the patient can be easily lifted, carried, and put down again. Of course if a limb be injured there ought to be a third person to take charge of it. Four persons can lift a patient with great ease and comfort in the following way: Two poles are placed one on each side of the patient, and the under sheet and blanket are firmly rolled round them. The four persons now stand two at each side facing the patient, and each one catches hold with one hand the end of the poles surrounded by the sheet, and with the other the pole near its centre. The patient in this way can be easily carried on to another bed or couch whilst his bed is being made.

CHANGING SHEETS.—By this I mean, of course, only the under sheets, and they can be changed in two or three ways, which I will now describe. One is to roll up lengthways the dirty sheet one side of the patient and push it as far as possible under his side; now roll up half the clean sheet and place the roll next to the other, and by gently turning the patient over these two rolls and taking away the dirty sheet and unfolding the clean one, you have only to turn your patient gently back, and the otherwise tedious business is accomplished. Another way is as follows: You raise your patient into a sitting posture and roll the dirty sheet from the head of bed downwards as far as possible.

You now roll up your clean sheet crosswise, and placing it nigh to the roll of dirty sheet you lay your patient down again and raise the lower extremities, and then you can easily pull down dirty sheet as also your clean one, and spreading the latter out and tucking it neatly under the mattress your patient is soon again comfortable.

Time will not permit me to go into all the other details of nursing, and so many good books are written on this interesting and useful subject that it would indeed be out of place in a lecture of this kind.

I have attempted to tell you how to do certain things that may at any time be useful to you, more especially in connection with emergencies, but before concluding, I should like to mention one thing that I always try to impress upon those who may have the charge of patients in severe and critical illness. Many persons have good memories, and many have, I am afraid, excessively bad ones, but even those who pride themselves upon their ability to retain what is told them, so often forget, that it is a good rule for the nurse to put down on paper or on a slate all the directions of the medical man with regard to medicines, nourishments, and other things, as also to make notes of all that has happened since his last visit, such as how long and how often the patient has slept, whether on awakening he has appeared refreshed, what time he has taken his nourishment and in what quantities, and numerous other details, which will not only save cross questioning, but also the medical man much time, and give him a clearer account of his patient's condition since his last visit; in fact he sees it all at a glance. I myself have found this wonderfully helpful in many serious illnesses.

I have now finished my course of lectures, and have tried my best to make them as clear and simple as possible, keeping however one object in view, and that has been not to attempt to teach you more than is

absolutely necessary for you to know, to enable any of you to act in cases of emergency, to the wellbeing of the injured or sick person until the case is taken out of your hands by the arrival of a medical man. If I have succeeded in this, I can only say that I for my part am quite contented.

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